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Operation IVY

PACIFIC PROVING GROUNDS

November 1952

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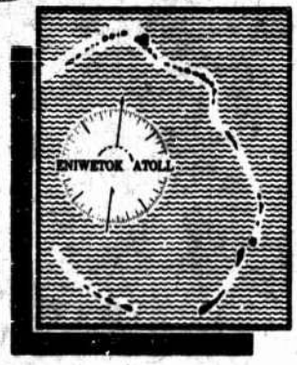

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JOINT TASK FORCE 132

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Report to the Scientific Director

DOCUMENTARY PHOTOGRAPHY

By

James L. Gaylord
Lt Col, USAF

Lookout Mountain Laboratory
Los Angeles, California
February 1953

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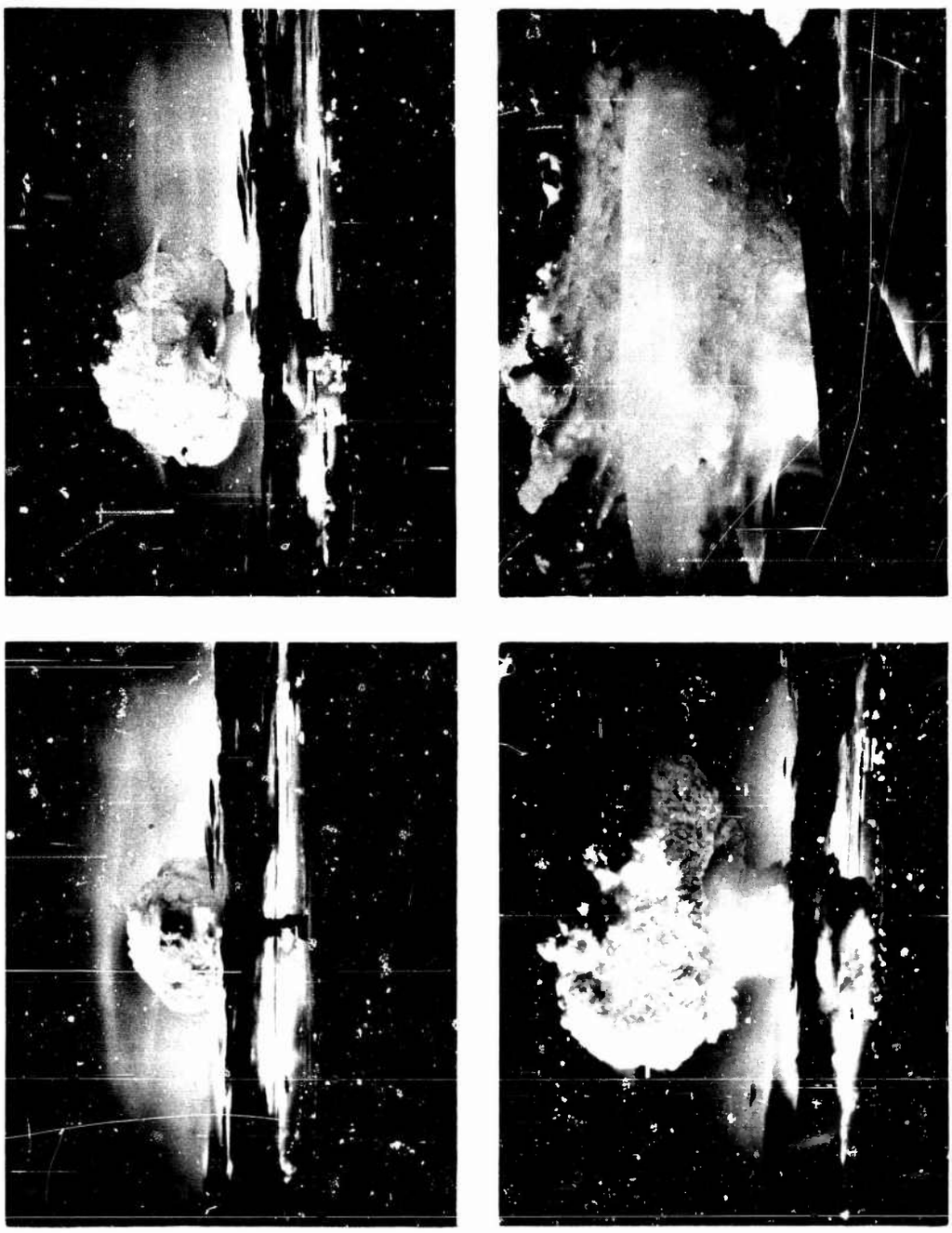
SCENES OF

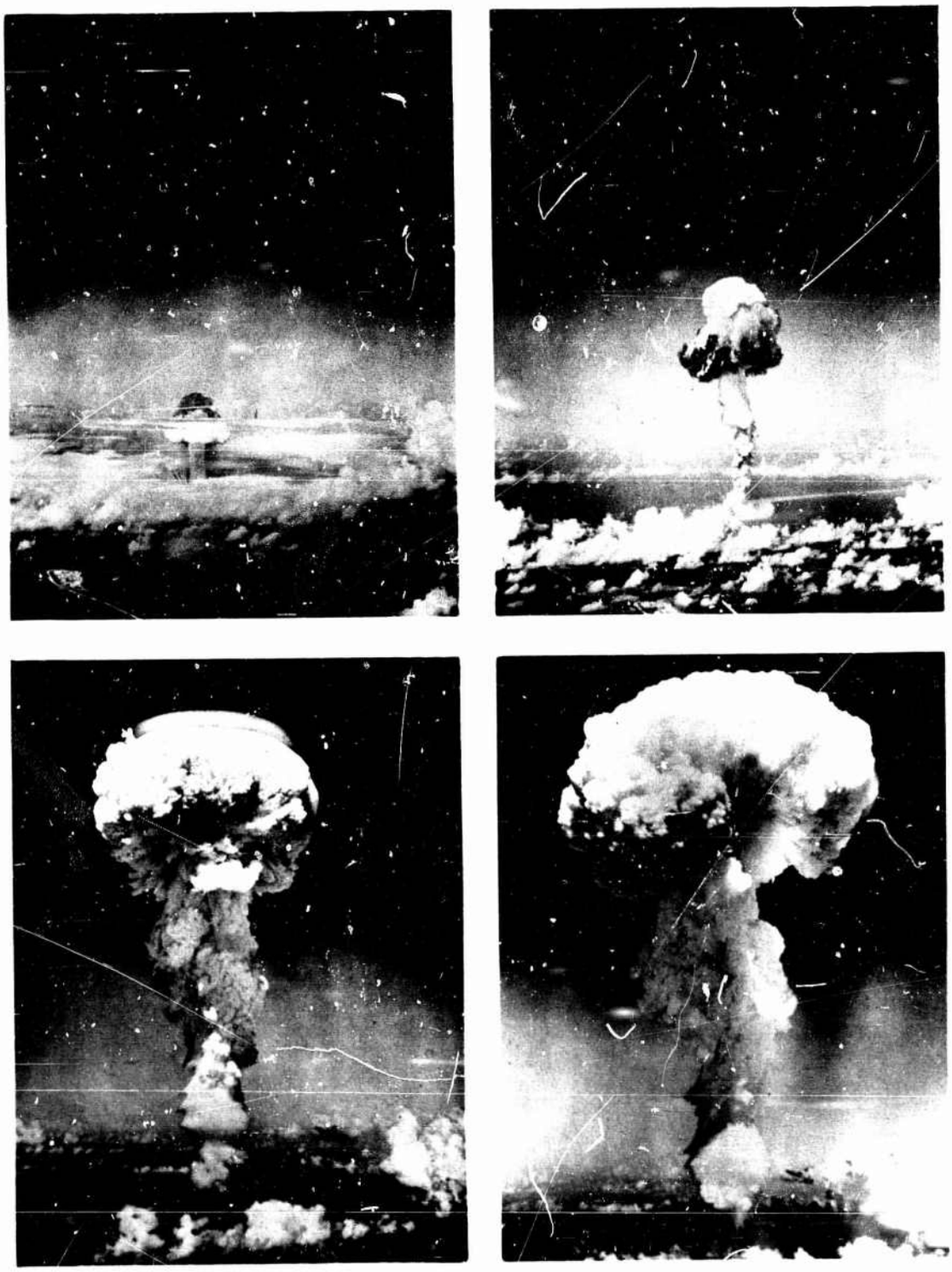
MIKE AND KING DETONATIONS

Mike Detonation



Mike Detonation

King Detonation



King Detonation

ABSTRACT

The objective of Task Unit 9 was to record on film, both still and motion picture, the activities connected with certain events and programs of Operation Ivy; this documentation was to serve as a basis for:

1. A photographic record for historical purposes.
2. A motion-picture report by the Commander, Joint Task Force 132 to the Joint Chiefs of Staff and to the Atomic Energy Commission, depicting the scope and conduct of Operation Ivy.
3. Still and motion-picture photography for special scientific reports.
4. Photography for future training and technical services.
5. Special photography as assigned by Commander, Task Group 132.1, and Commander, Joint Task Force 132.

In order to obtain the foregoing objective, a photographic unit, known as Task Unit 9, was organized to operate directly under the Scientific Task Group, 132.1. This unit accomplished the necessary field photography and, at the time this report was written, was still in the process of editing this footage at Lookout Mountain Laboratory to form a completed motion-picture record.

PREFACE

This report is the final summation of the activities of Task Unit 9 in obtaining the documentary photography during Operation Ivy.

It is intended to replace the preliminary report of Task Unit 9 submitted to the Commander, Task Group 132.1, on 3 December 1952.

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CHAPTER 1

REPORT OF OPERATIONS—ZONE OF INTERIOR PHASE

1.1 ACTIVATION OF UNIT

Following preliminary conferences between members of Joint Task Force (JTF) 132, Headquarters U. S. Air Force, Task Group (TG) 132.1, and Lookout Mountain Laboratory, Task Unit 9 (TU 9) was activated by General Orders No. 3, Headquarters Task Group (HTG) 132.1, Los Alamos, N. M., on 22 January 1952 pursuant to authority of Section 1, General Orders No. 1, Headquarters, JTF 132 dated 2 January 1952.

1.1.1 Objectives

Complete documentary motion-picture and still coverage of Operation Ivy was required and obtained to produce a scientific historical documentary motion picture of Operation Ivy that would summarize the record of the operation and would not be limited by security classification. This film will not be required to contain Top Secret Restricted Data. Such data will be included, however, if deemed necessary to portray the history of the operation. In the event that this film is Top Secret, only three prints will be made, with distribution as follows: AEC, Washington, D. C.; Chief, AFSWP, Washington, D. C.; and AEC, Los Alamos, N. M.

In the event that the film being produced is given a final security classification of Top Secret, it will be reedited to produce a film with a lower security classification so that it may be shown to larger audiences. To produce this version, all Top Secret sequences will be removed to make the classification no higher than Secret. Seven copies of this reedited version will be made and distributed as follows: JTF 132, Washington, D. C.; AEC, Washington, D. C.; Chief of Staff, Army; Chief, Naval Operations; Chief of Staff, USAF; Chief, AFSWP, Washington, D. C.; and AEC, Los Alamos, N. M.

Complete still coverage of Operation Ivy, including photographs for historical purposes, was required of the various Task Units and Task Groups.

All film exposed on Operation Ivy is to be catalogued and indexed. Cataloguing will be accomplished utilizing the microfilm process, with one copy of the final catalog to be distributed to AEC, Los Alamos, N. M., and one copy to AFSWP, Washington, D. C. AFSWP is to be the coordinating authority for additional prints of any stock footage shown in the catalog that are required by Department of Defense agencies.

No restrictions have been imposed on the length of the documentary film; however, approximately 60 min running time is desirable. The film is to document Operation Ivy, the problems encountered and the solutions to these problems.

1.1.2 Personnel

(a) Procurement. Personnel for TU 9 was for the most part drawn from the U. S. Air Force, Lookout Mountain Laboratory. This group consisted of 8 officers, 6 airmen, and 13

civilians permanently assigned to Lookout Mountain Laboratory but detailed to TU 9 for the duration of Operation Ivy.

In order to supplement this group, TU 9 requested TG 132.1 to initiate a request to JTF 132 to supply an additional complement of 18 persons; this group was to possess appropriate photographic specialties and to be physically qualified for overseas-duty assignment.

Of the 18 people requested, 10 were lost to TU 9 for the following reasons:

Physically unqualified	2
Professionally unqualified	1
Insufficient time remaining in current enlistment to allow overseas assignment	2
Clearance denials	2
Clearance not initiated in time to be completed prior to assignment to operational duty	3

Therefore 10 staff members of Lookout Mountain Laboratory were detailed from assignments on other projects to replace these 10 people. This occasioned a serious handicap to the fulfillment of other projects previously committed by Lookout Mountain Laboratory.

(b) Radiation Physical Examinations. Lookout Mountain Laboratory has no medical facilities; therefore the required radiation physical examinations were obtained for all personnel, military and civilian, through the cooperation of the director of the Atomic Energy Project at the University of California, Los Angeles, using the medical facilities of that organization.

(c) Organization. Since TU 9 was to operate from two bases in the Forward Area, Kwajalein and Eniwetok, it was organized as illustrated in the organizational chart (Fig. 1.1).

1.2 PHOTOGRAPHIC AIRCRAFT

1.2.1 Procurement

Three C-54 aircraft were assigned to TU 9 from the Military Air Transport Service (MATS) for use during the operation.

One RB-50 aircraft was assigned from the Strategic Air Command (SAC), and a replacement was obtained following the destruction by fire on Eniwetok of the original aircraft (Sec. 2.2.7).

1.2.2 Modification

No modification was needed on the RB-50 aircraft. It was necessary to modify the C-54 aircraft for photographic purposes as follows:

1. A multiple-camera flexible rack was fabricated and installed at the cargo-door position of each aircraft (see Figs. 1.2 to 1.4). Design and fabrication of these racks were accomplished by the Technical Photographic Services Section at Wright-Patterson Air Force Base, Dayton, Ohio.

Installation of the racks was accomplished by the 1500th Maintenance Group, MATS, Hickam Air Force Base, Hawaii. Installations on the C-54's which were done at Hickam Air Force Base were made at that location because the three C-54 aircraft were based there.

2. A slip-stream spoiler was fabricated and installed at the leading edge of the cargo door. This was necessary to reduce wind buifeting of cameras in flight when the cargo door was removed. This work was accomplished by the 1500th Maintenance Group, MATS, at Hickam.

3. Installation and wiring of a 110-volt auxiliary power source was necessary. This involved the installation of special generator equipment and was done by the 1500th Maintenance Group, MATS, at Hickam.

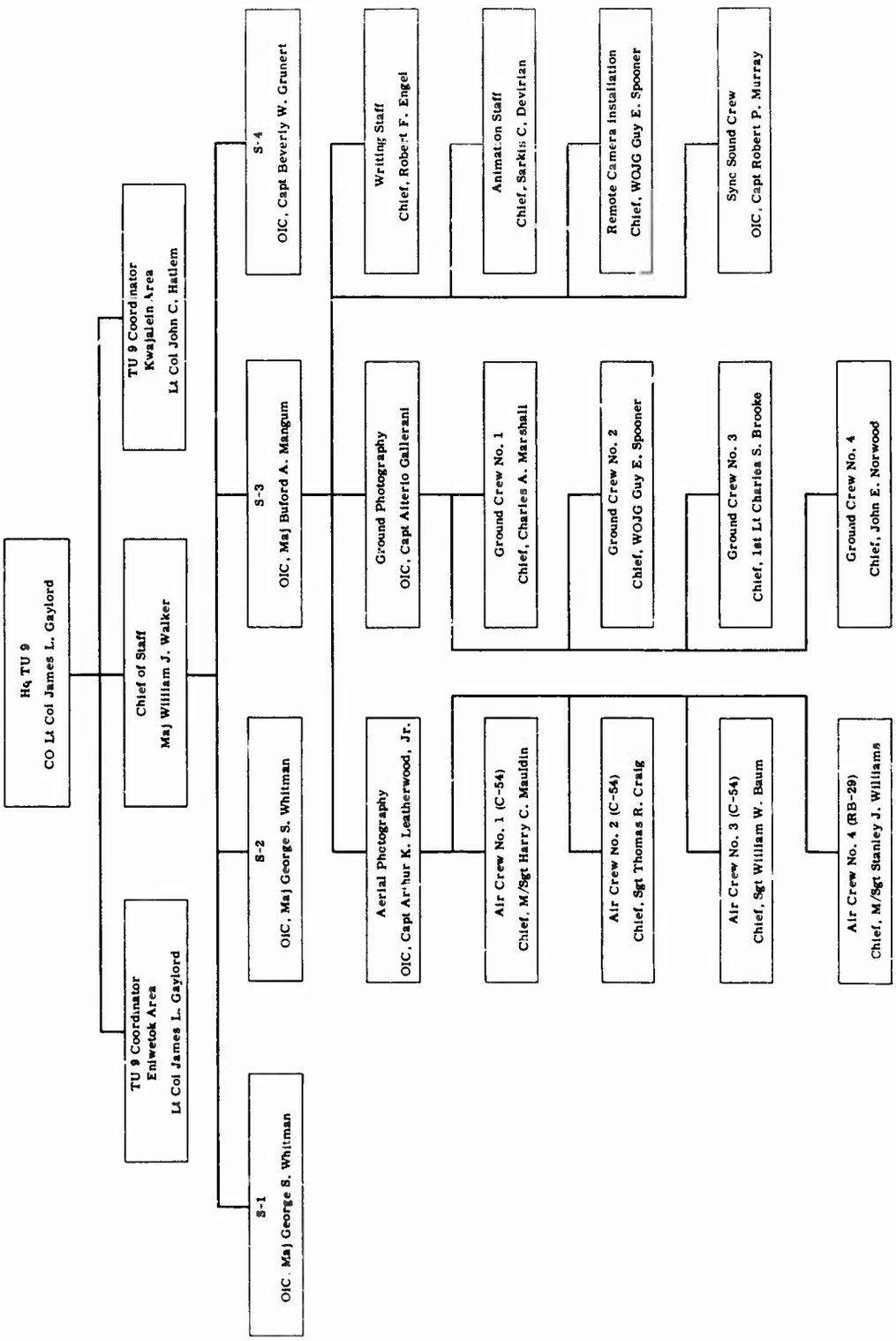

Fig. 1.1—TU 9 organizational chart.

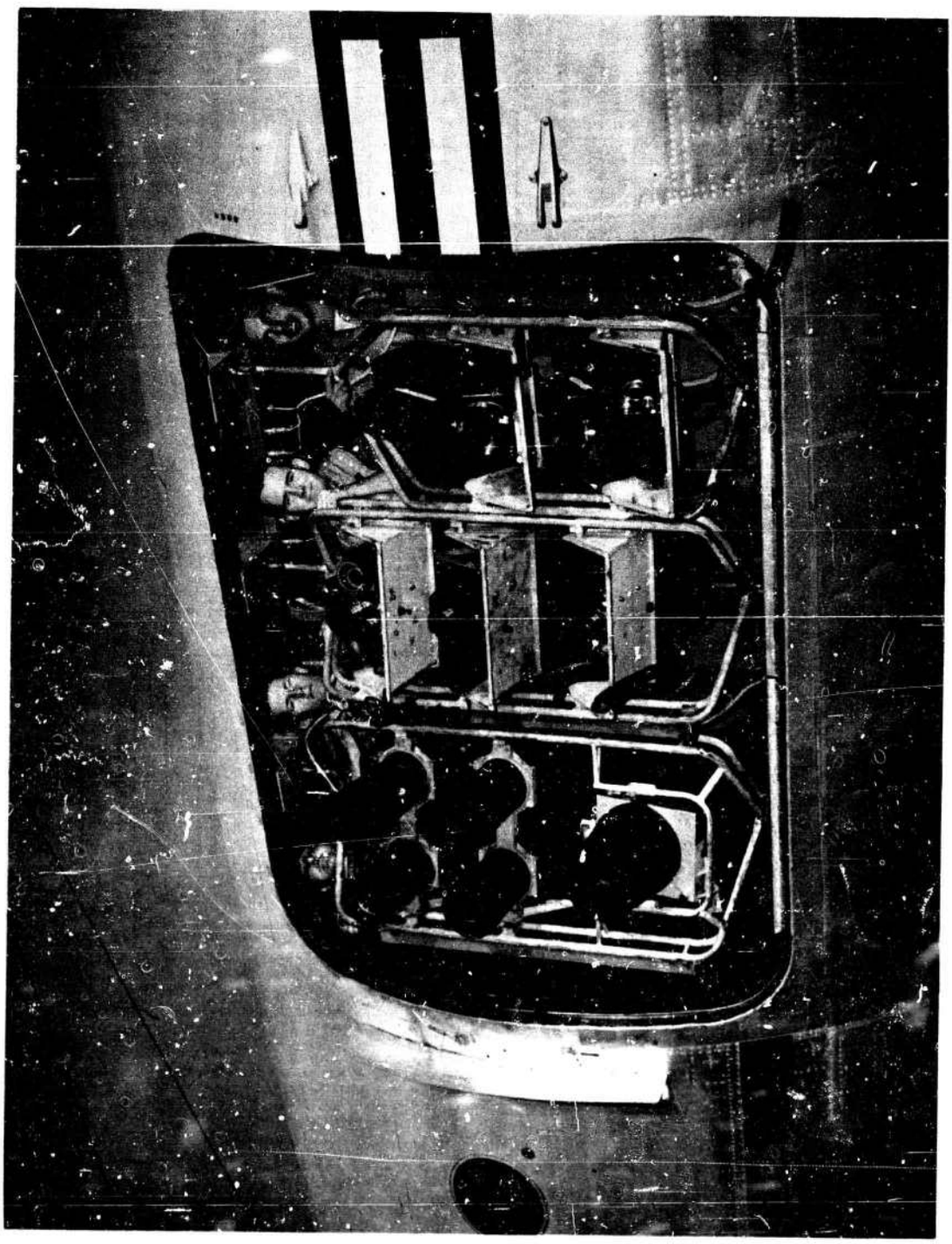

Fig. 1.2—C-54 photographic aircraft, showing camera installation and slip-stream spoiler.

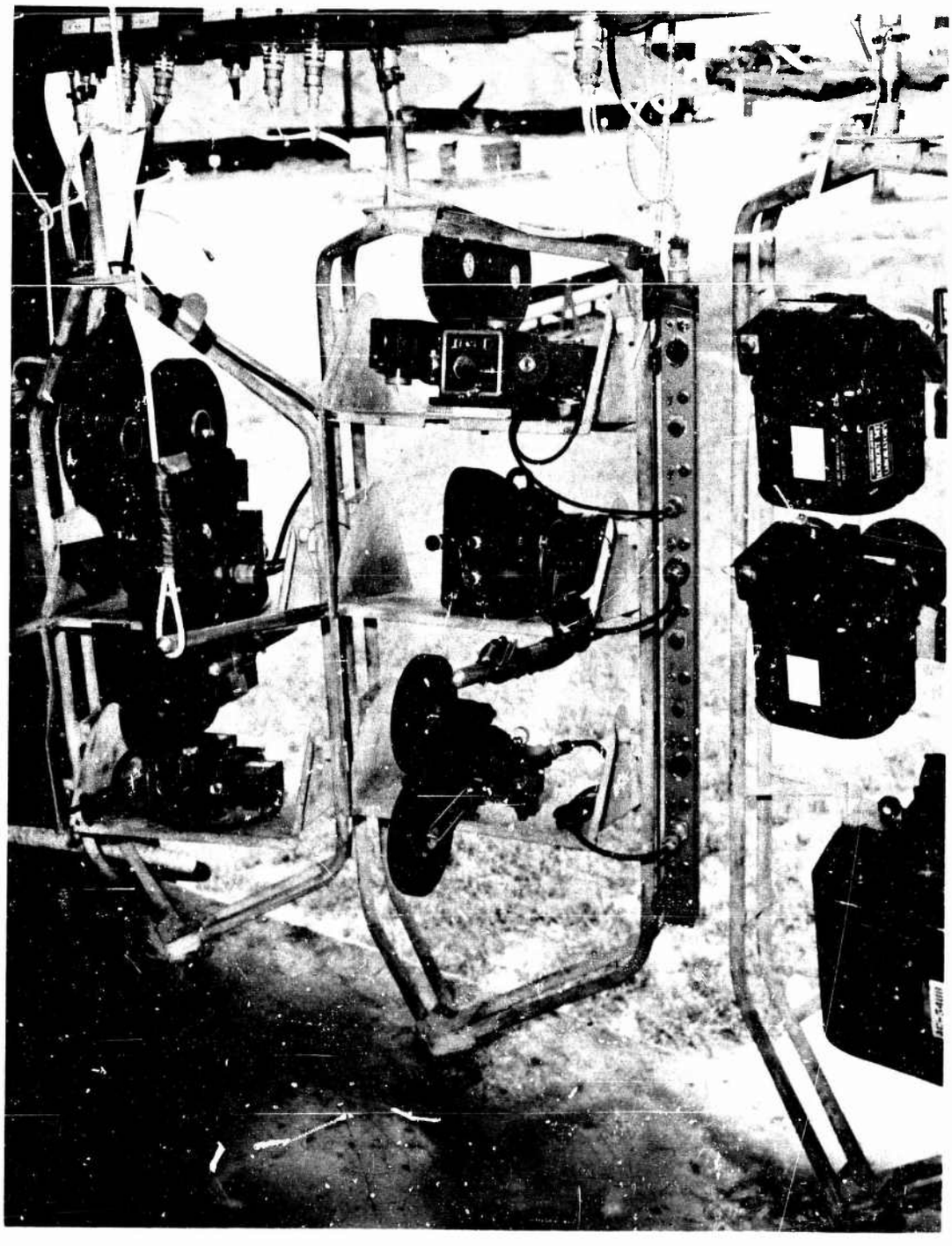

Fig 1.3—Flexible racks for motion-picture cameras installed in C-54 photographic aircraft.

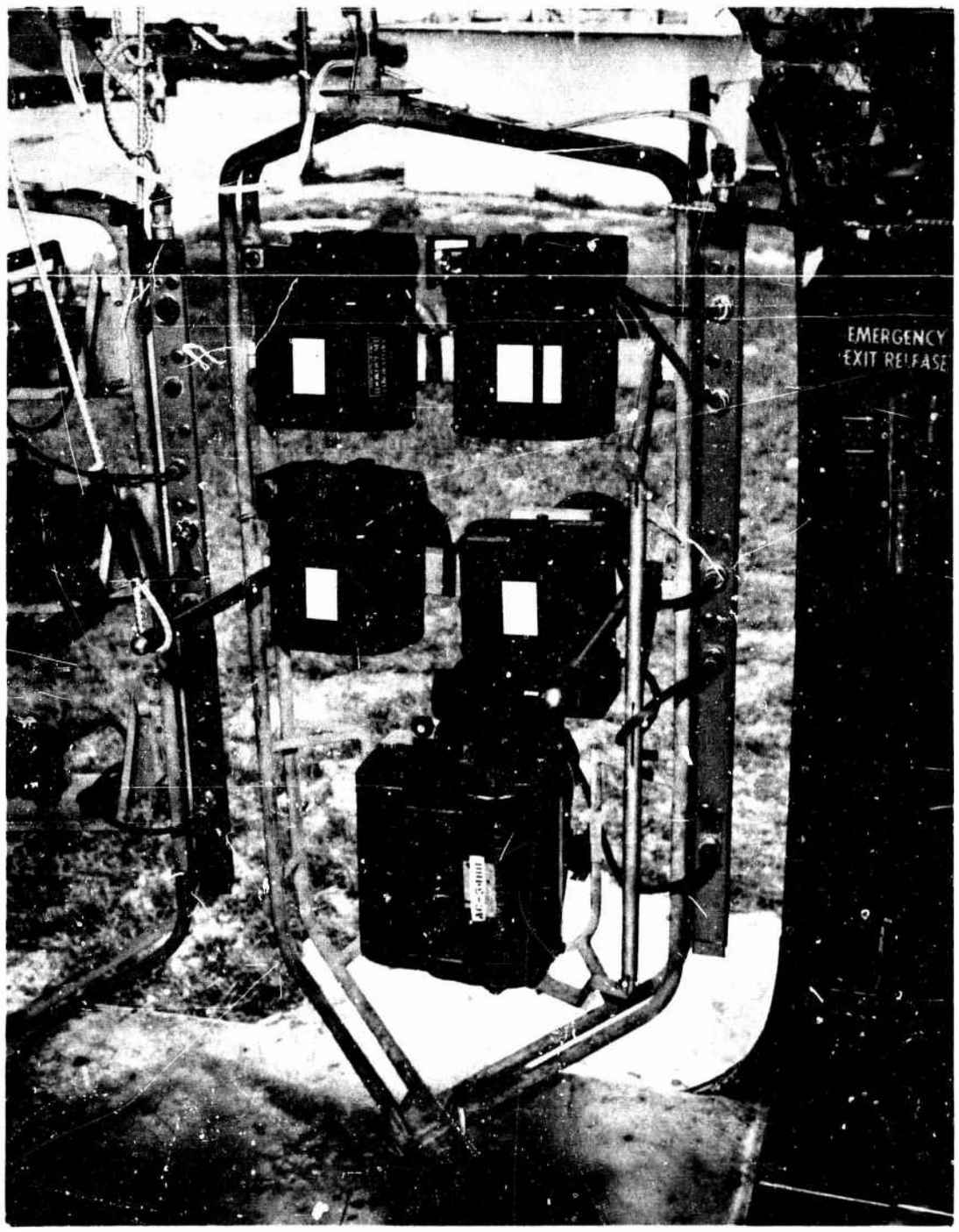

Fig 1.4—Flexible racks for aerial still cameras installed in C-54 photographic aircraft.

4. Special communications equipment was installed at the cargo-door position to provide five jackboxes and earphones and one microphone outlet. This equipment was installed by the 1500th Maintenance Group, MATS, at Hickam.

5. Since the possibility of radiation exposure was present, provision had to be made for five oxygen outlets capable of supplying 100 per cent oxygen to photographic-crew members at the cargo-door position (Fig. 1.5). This equipment was fabricated and installed by the 1500th Maintenance Group, MATS, at Hickam.

6. Fabrication and installation of an electrical power-distribution and signal panel (Fig. 1.6) to supply various types of power to cameras in the racks were necessary. Fabrication was accomplished at Lookout Mountain Laboratory, and installation was made by the 1500th Maintenance Group, MATS, at Hickam.

1.2.3 Photographic Flight Crews

Photographic-crew members were selected from members of TU 9, as determined by the experience and skills of each person. Appropriate ground training was given at Lookout Mountain Laboratory.

Twenty-two persons were selected for flight duty. Included were four complete crews for C-54 aircraft (one for reserve) and additional personnel to man cameras in the RB-50 and other aircraft where positions could be made available.

The necessity for requesting flight status for additional crew members over and above the immediate need was amply justified during Operation Ivy. During the aerial photography on Mike Day, the crew members of the crater-survey aircraft received levels of radiation exposure which precluded their flying on King Day or at any location where additional radiation exposure was possible.

1.3 LOGISTICS

1.3.1 Specialized Equipment

Design, fabrication, and/or procurement of specialized equipment for use by TU 9 was an important aspect of the preoperational phase.

1. Casings for six remotely operated cameras were designed by Lookout Mountain Laboratory and fabricated by local commercial facilities. Proof testing of these casings was carried out in the Nevada experiments in May and June 1952, and based upon results of these tests certain modifications of the casings were incorporated for use on Operation Ivy. The design and configuration of these casings were as illustrated in Fig. 1.7.

2. Special camera booms were designed by Lookout Mountain Laboratory for installation on weapons carriers in order to facilitate operations in the field. These were fabricated by local commercial facilities. They were invaluable equipment for ease of rapid portability and for obtaining certain photographic effects. The design was as illustrated in Fig. 1.8. Pictures of the camera boom in use are shown in Figs. 1.9 and 1.10.

3. Special-purpose radio equipment for installation in vehicles and for island-to-island communication was requested early in the operation. After clearance by the JTF communications officer, six Motorola radios plus one base station were procured from funds allotted to TU 9 for specialized equipment. The basis for granting approval for use of this equipment by TU 9 was that, since TU 9 was a part of a permanent organization, such equipment could be used experimentally on Operation Ivy and, if acceptable in performance, would continue to be used by Lookout Mountain Laboratory in future operations and on any Nevada tests.

4. Four weapons carriers were procured from the Department of the Army and converted to special-purpose camera vehicles by installing the camera boom described earlier.

5. One administrative-office trailer was renovated and air-conditioned by the 822nd Air Force Specialized Depot, Maywood, Calif. One equipment trailer was renovated by the same

Fig. 1.5 — Breathing-oxygen equipment for installation in C-54 photographic aircraft.

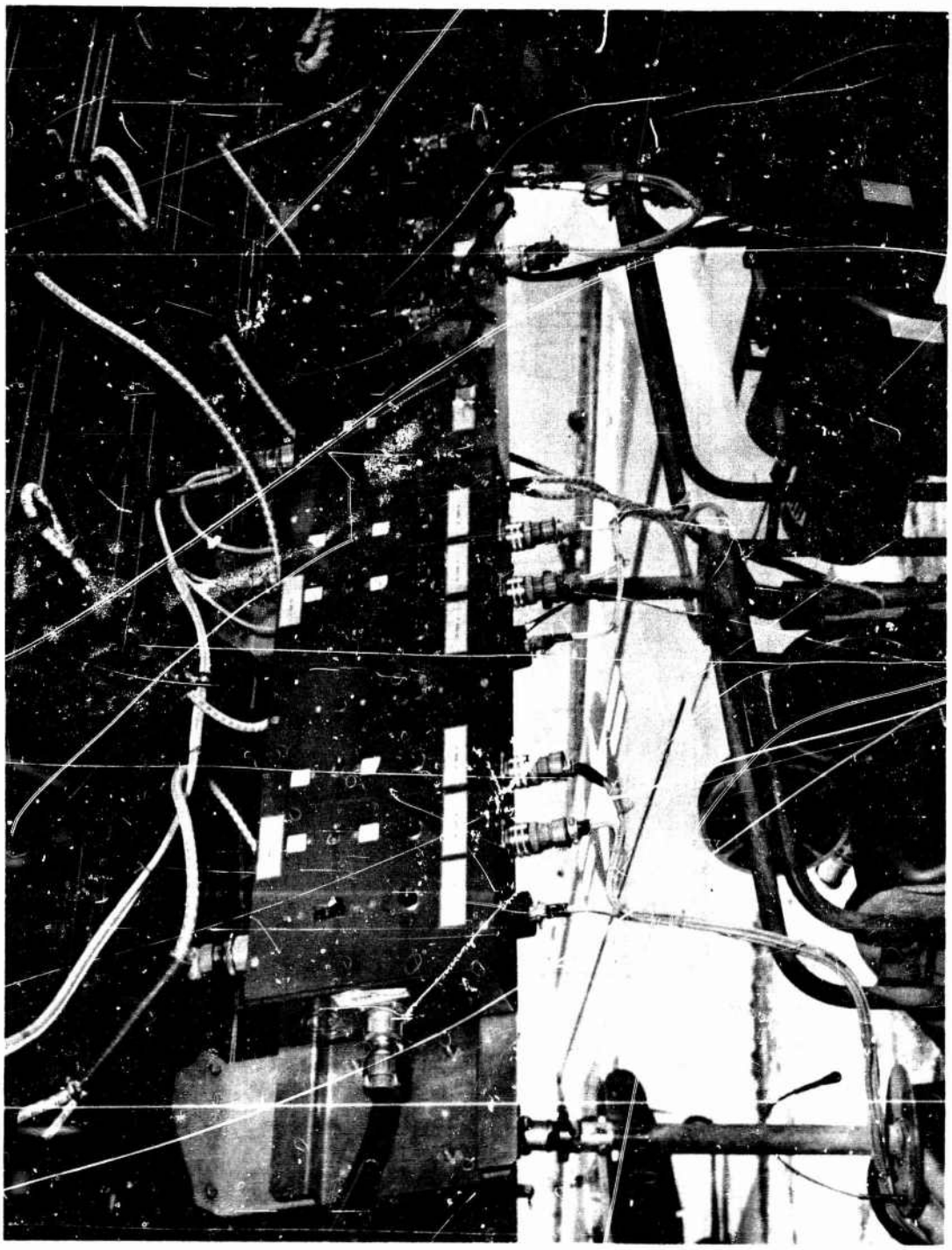

Fig. 1.6—Electrical power-distribution, signal and intervalometer panel in C-54 photographic aircraft.

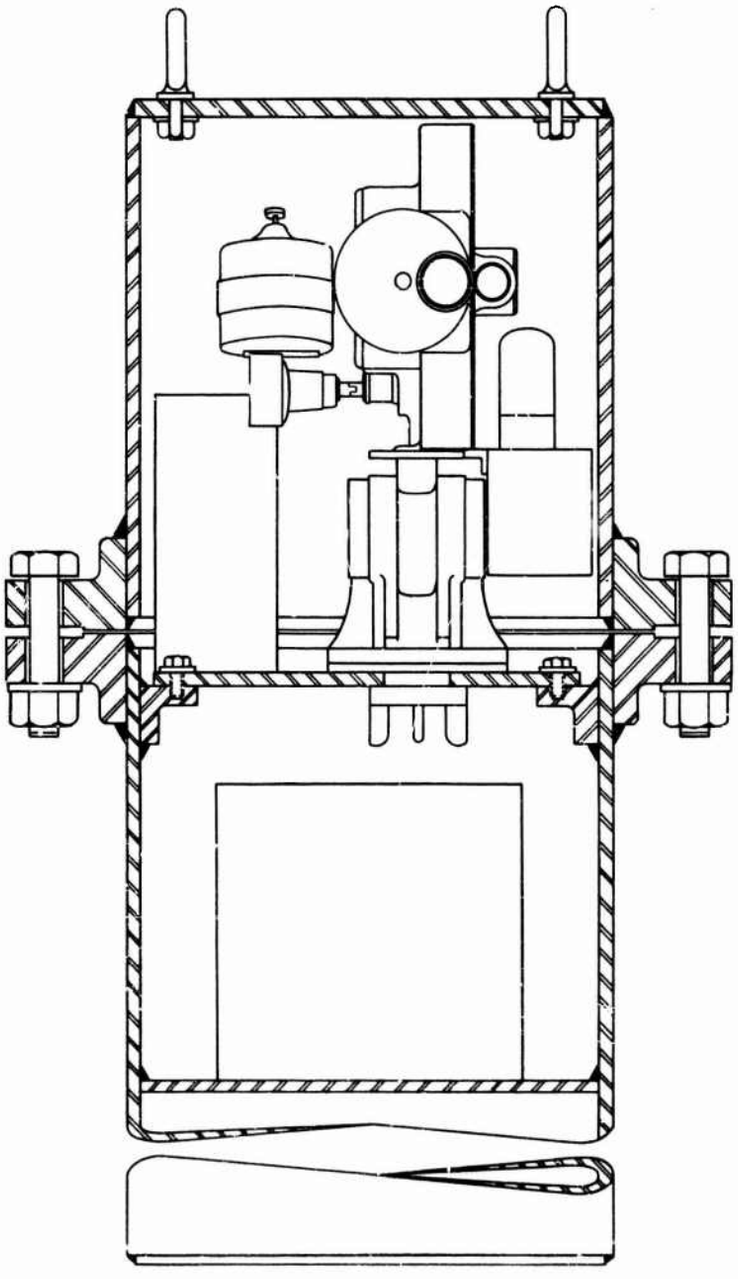

Fig. 1.7—Auto-remote camera installations.

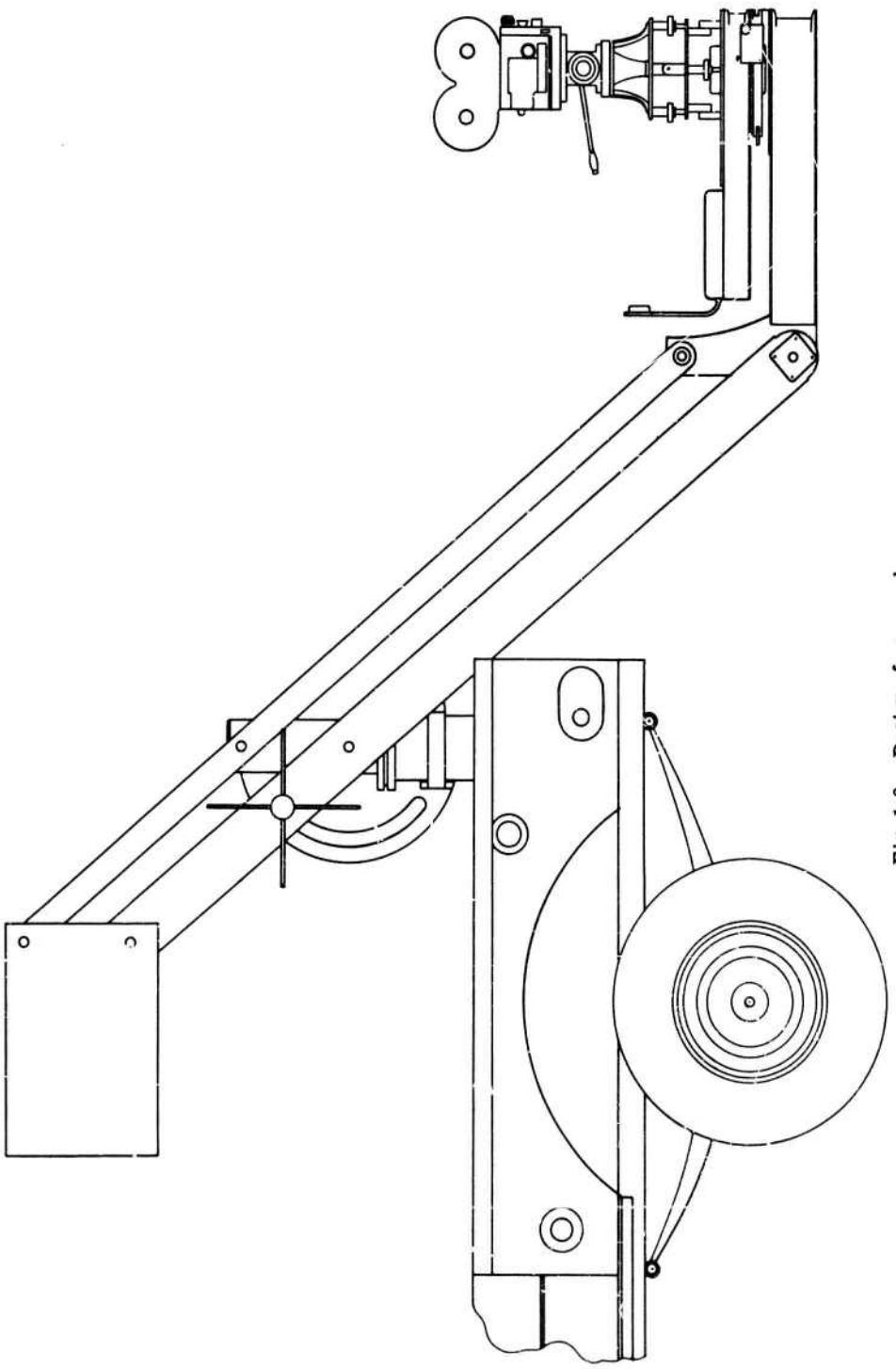

Fig. 1.8—Design of camera boom.

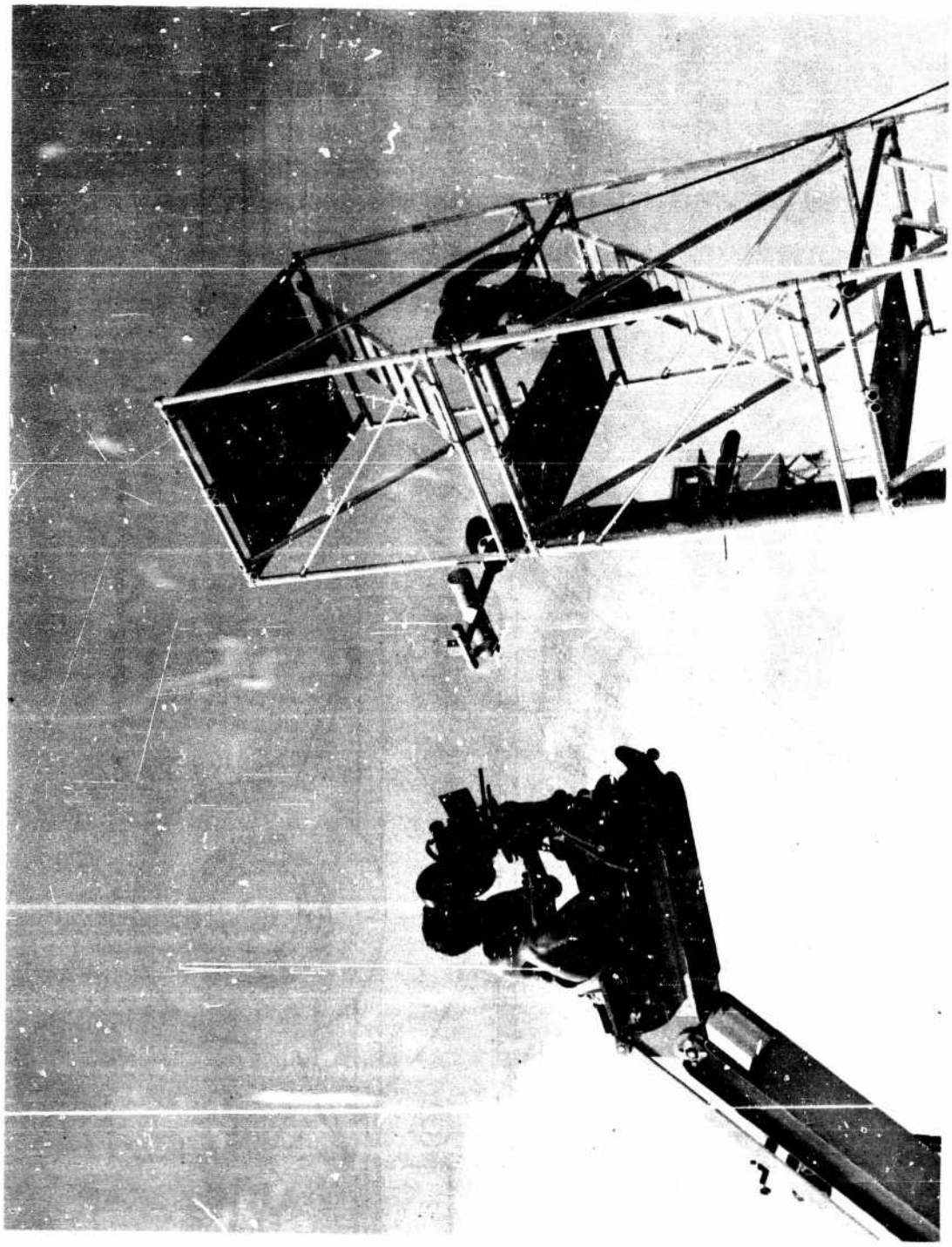

Fig. 1.9 — Special-purpose camera boom in use.

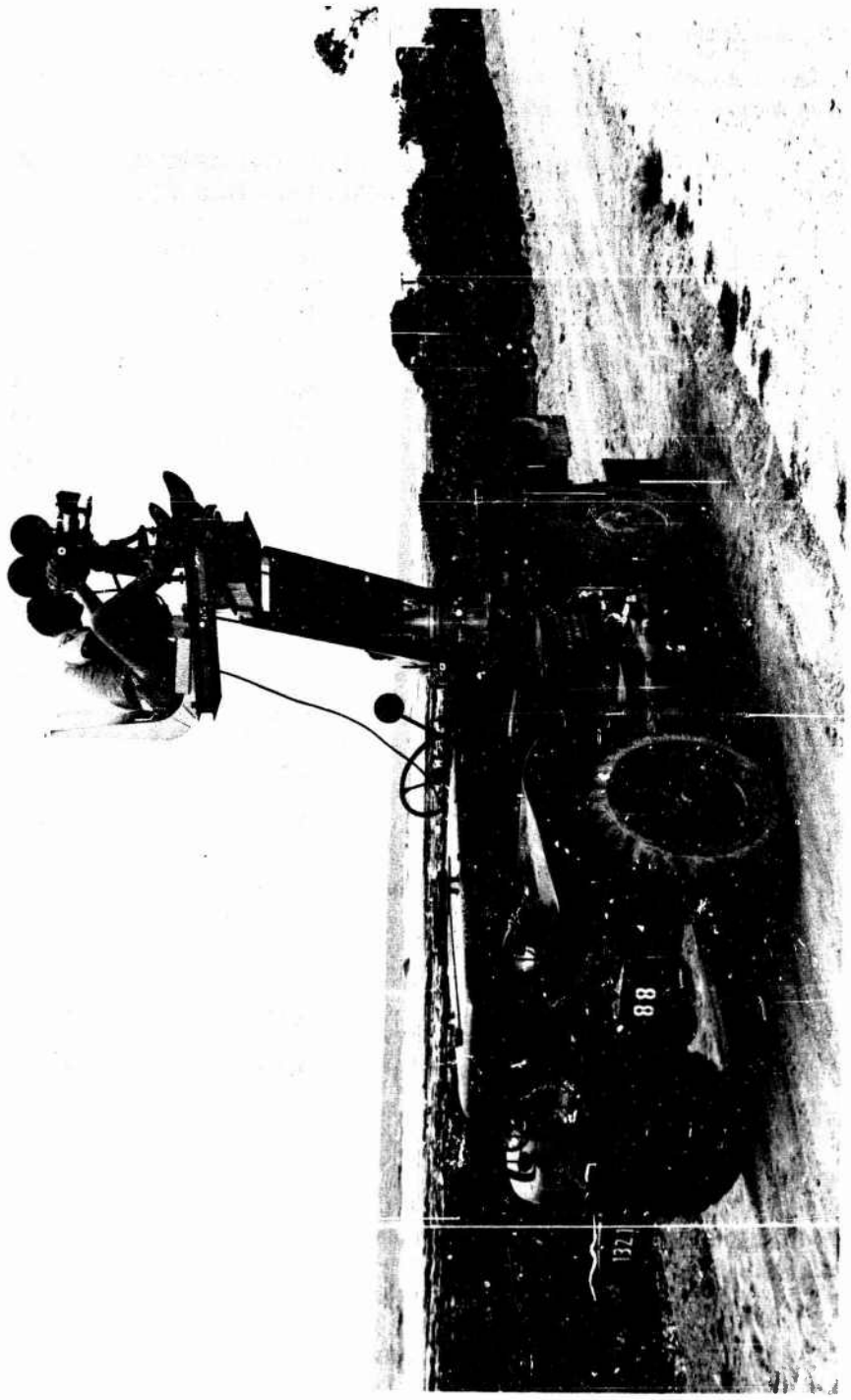

Fig. 1.10—Camera boom, showing installation on weapons carrier.

unit, and both trailers, loaded with water-lift camera equipment, were dispatched to the Forward Area in September 1952.

1.3.2 Movement

Air- and water-lift movement of equipment and personnel to and from the operations site was as shown in Tables 1.1 and 1.2.

Table 1.1—AIR- AND WATER-LIFT MOVEMENT OF EQUIPMENT TO AND FROM OPERATION SITE

Movement	Pounds	Tons	Cube
9 September to 15 October			
To operation site:			
Air	26,934	13.5	1,870
Water	99,116	49.5	11,649
Totals	126,050	63.0	13,519
To Eniwetok:			
Air	15,775	7.9	1,139
Water	68,125	34.0	6,747
Totals	83,900	41.9	7,886
To Kwajalein:			
Air (Project 3.7)	5,768	2.9	258
Water (Project 3.7)	12,804	6.4	890
Air (TU 9)	5,391	2.2	473
Water (TU 9)	18,187	9.0	4,012
Totals	42,150	21.0	5,633
25 November to 1 December			
Return from operation site to Lookout Mt. Lab.:			
Air	7,500	3.8	397
Water	112,293	56.0	12,889
Totals	119,793	59.8	13,286

1.4 BUDGET

The approved budget, broken down in the following tabulation, amounted to a total of $142,100.

01	Civil overtime	$ 11,220
02	Temporary duty	23,880
03	Freight and express	1,000
07	Contractual services	50,000
08	Material and supplies	46,000
09	Equipment	10,000
	Total	$142,100

Table 1.2—AIR- AND WATER-LIFT MOVEMENT OF PERSONNEL TO AND FROM FORWARD AREA*

Date	Officers	Airmen	Civilians
Departed for Forward Area			
21 Mar.			2
25 July		3	1
31 July	1	1	1
29 Aug.			1
3 Sept.	2	3	1
8 Sept.	7	6	8
9 Sept.		1	
15 Sept.		1	1
17 Sept.			2
23 Sept.	1		
27 Sept.			1
1 Oct.		1	
10 Oct.			1
13 Oct.			1
17 Oct.			1
18 Oct.	1		1
24 Oct.			1
Returned from Forward Area			
8 Apr.			2
31 Aug.		1	
2 Oct.	1		
9 Oct.			1
13 Oct.			2
25 Oct.			1
29 Oct.			1
31 Oct.			3
1 Nov.			2
5 Nov.	1		
6 Nov.			1
8 Nov.			2
10 Nov.		2	
11 Nov.	1		
13 Nov.	1		1
15 Nov.			1
17 Nov.	1		1
18 Nov.	2		
20 Nov.	1		
21 Nov.	3	10	5
23 Nov.		2	1
25 Nov.	1		
12 Dec.		1	

*All movements were by air.

1.5 SECURITY

Rigid security controls were established for the handling of all film and classified material. All film, both still and motion-picture, was classified and handled as Secret Restricted Data prior to exposure. Following exposure, film was classified as either Secret Restricted Data or Top Secret Restricted Data, depending upon the subject matter, and was then held for review by the classification officer of TG 132.1 for any downgrading. In this way the film accountability was assured and maintained.

Special couriers were designated for the transport of all exposed and unexposed film between the Zone of Interior and overseas sites. Courier orders for each individual designated that the primary duty would be to transport this film, thereby ensuring prompt and secure delivery of the material.

1.6 OPERATIONS DURING THE ZONE OF INTERIOR PHASE

1.6.1 Script

The complete first draft of the documentary motion-picture script was prepared during the period 1 February 1952 to 31 July 1952. The script was coordinated with all appropriate agencies, such as the staff of JTF 132, Atomic Energy Commission, TG 132.1, and TG 132.4, to ensure technical accuracy and treatment suitability.

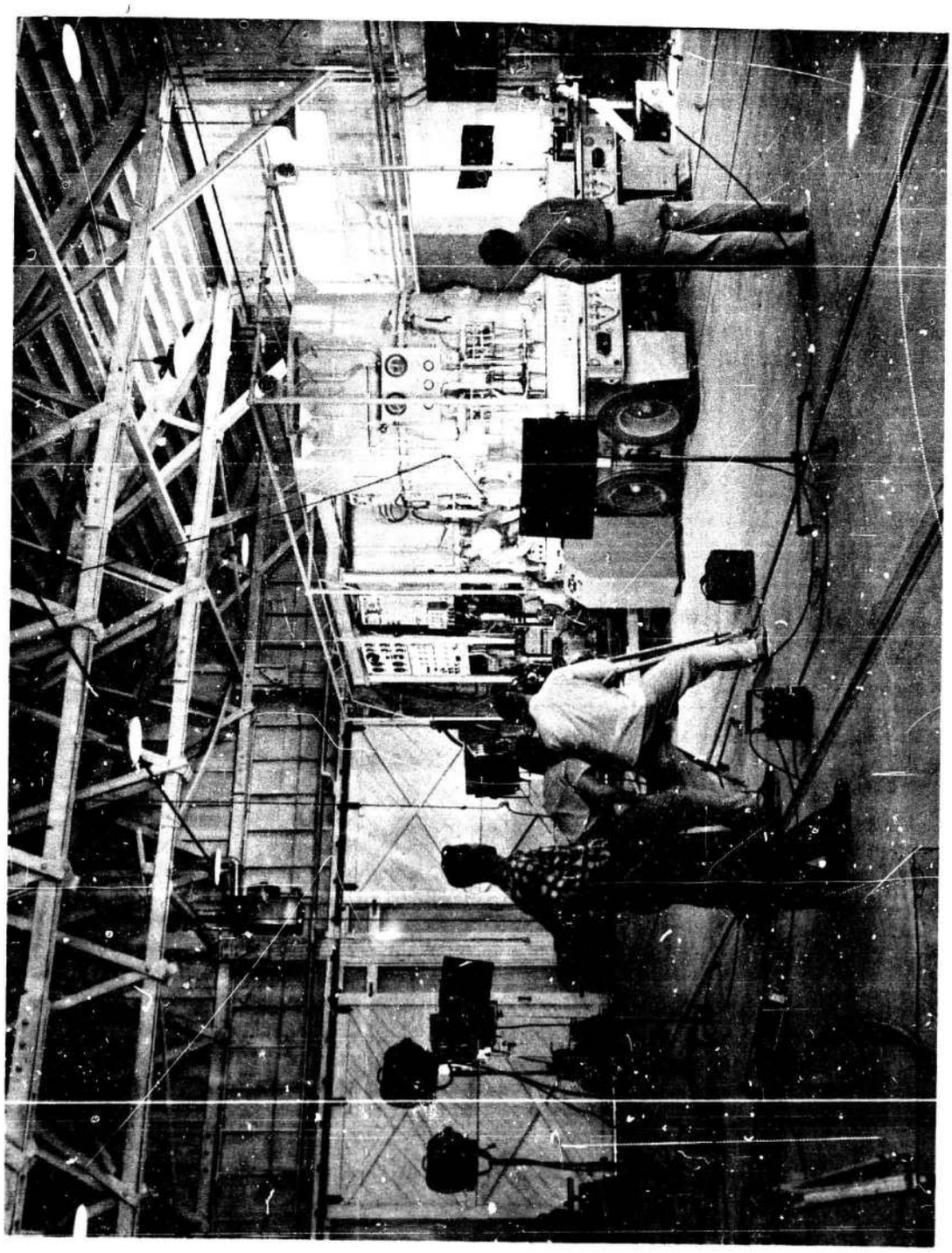

Fig. 1.11—Photographic crew at National Bureau of Standards liquid-hydrogen plant, Boulder, Colo.

1.6.2 Zone of Interior Photography

Photographic crews were dispatched from Lookout Mountain Laboratory on 10 July 1952 and 23 July 1952 for purpose of photographing certain phases of the cryogenics and assembly work at Los Alamos as called for in the script.

On 25 July 1952 additional cryogenics scenes were photographed at the National Bureau of Standards cryogenics plant at Boulder, Colo. (see Fig. 1.11).

On 12 July 1952 photographs of the trial assembly at Buffalo, N. Y., were obtained.

1.6.3 Project 3.7

On 7 May 1952 Project 3.7 was assigned to TU 9 by AFSWP through the Air Force Research and Development Command. The purposes of this project were (1) to locate ground zero of Mike Detonation through back triangulation (data to be obtained through aerial, vertical, still photography) and (2) to determine the depth and width of the crater, the height of crater lips, and the depth of debris fallback in the crater. The requirement for the second phase of the project was later canceled.

In conjunction with the aerial photography of Project 3.7, TU 9 was assigned to obtain aerial photographs of Eniwetok and Bikini atolls for the engineering staff of TG 132.1. These photographs were for the purpose of preparing photomosaics from which accurate, up-to-date charts of these atolls could be prepared.

A fund of $35,000 was allotted to TU 9 for the accomplishment of this project, of which all but $10,000 was subsequently returned.

This project is the subject of a separate report now in preparation.

CHAPTER 2

REPORT OF OPERATIONS—OVERSEAS PHASE

2.1 ORGANIZATIONAL SETUP

The organization was as outlined in the TU 9 organizational chart shown in Fig. 1.1. In the early phase of operation the Eniwetok unit comprised a total of 30 persons: 8 officers, 11 airmen, and 11 civilians. Of this total, one crew, consisting of one officer, one civilian, and three airmen, was dispatched to the Mike Shot area for full-time duty to document the Mike assembly progress in that area.

Administrative, operational, and living space at Eniwetok were provided by TG 132.1.

The Kwajalein unit comprised a total of six persons: two officers, three airmen, and one civilian. Operational and camera-repair space was provided by TG 132.4. Camera-storage and administrative space was provided by TU 9 through the utilization of special-purpose trailers.

By M–3 day all personnel of TU 9 on Eniwetok were evacuated and distributed as shown in Table 2.1.

Table 2.1 — EVACUATION OF TU 9 PERSONNEL FROM ENIWETOK FOR MIKE DAY

No. persons	Date	Base	Assignment
5	M–2	USS Curtiss	Proceed to Kwajalein M+1 day
3	M–1	USS Rendova	Installation-recovery team for remote cameras; recovery to be made as soon as cleared by the Radiological Safety Group
1	M–3	USS Estes	
1	M–3	USS Rendova	Return to Eniwetok for airlift to Zone of Interior
1	M–3	USS Shanks	Proceed to Kwajalein
14	M–3	Kwajalein	Air crew members to participate in M–3 dress rehearsal, then to proceed to base at Kwajalein
6	M–10	Kwajalein	Sound crew

2.2 OPERATIONAL PROCEDURES

2.2.1 Work Orders

Photography for each scene of the approved script was accomplished according to written work orders (Fig. 2.1) prepared by the Operations Section of TU 9. After completion of the assigned photography, work orders and completed caption sheets (Fig. 2.2) were returned, and data from these were entered on a master control board, where up-to-date daily progress could be noted. Caption sheets were then forwarded with exposed film to aid in the cataloguing process.

Figures 2.3 to 2.10 show camera crews and individual photographers executing various assignments.

2.2.2 Security Control

Security of film and classified documents was tightly controlled. Film was secured in a locked refrigerated film-storage trailer vault supplied by TU 9. From here it was logged in and out by the security officer by the use of inventory registers and receipt systems. Documents were secured in 3-combination safes and controlled in the same manner.

2.2.3 Film Processing

No great amount of film was required to be processed in the Forward Area. That film which was processed was handled as follows:

1. Aerial still film amounting to 10 rolls was processed and printed in the photographic laboratory aboard the USS Estes.
2. Ground still photographs amounting to approximately 800 negatives were processed and printed in the TU 8 photographic laboratory on Parry Island.
3. Certain motion-picture test film and remotely operated camera film from shot days were processed in the mobile processing laboratory of Edgerton, Germeshausen & Grier, Inc. (EG&G).
4. Aerial mosaic film of Eniwetok and Bikini was processed and printed in the Navy photographic laboratory on Kwajalein, with the assistance of Naval personnel there.

2.2.4 Communications

Communication between units in the field and TU 9 Headquarters on Parry Island was accomplished through the use of commercial type VHF radio equipment. Mobile units were mounted in each of four camera trucks, and one base station was installed at Headquarters. The assigned frequency was 49.5 Mc.

This system of communication during the operation proved invaluable in that up-to-the-minute information was available at all times and complete control of mobile crews in the field could be maintained.

2.2.5 Remote Camera Installation and Recovery

A special crew of three men was established for the purpose of installing and recovering film and equipment (Figs. 2.11 and 2.12) from the six remote camera stations (Fig. 2.13) used on Mike Day and from the three stations used on King Day (Fig. 2.14).

For Mike and King detonations these cameras were installed as follows:

Station 390.01, Engebi: One 16-mm camera was pointed at the north and west sides of the multistory building on Engebi. This camera, triggered by a photocell and loaded with a special panchromatic film, emulsion type 918, operated successfully on both the Mike and the King tests.

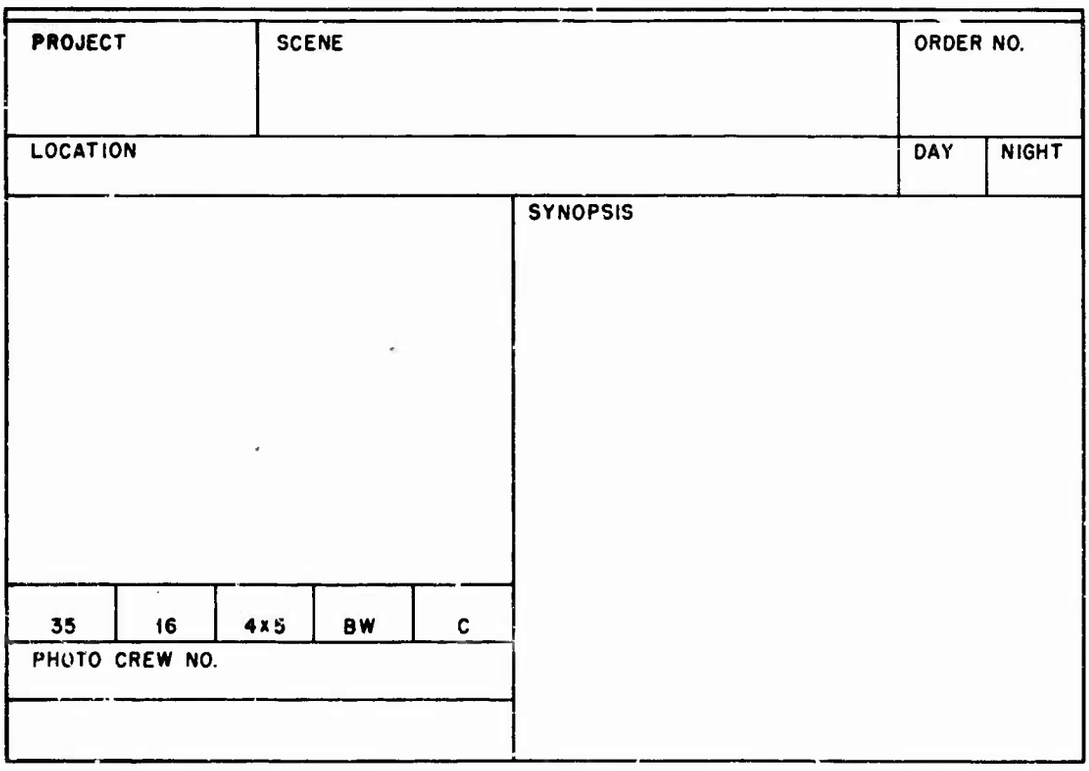

Fig. 2.1—Photography work-order form.

PHOTOGRAPHERS CAPTION SHEET	ALTITUDE	PLANE OR TOWER NO.	FILM SERIAL NO.	DATE	LOG NO. Do not write in this space	INDEX NO.
CAMERA POSITION	TYPE	CAMERA SERIAL NO.	PHOTOGRAPHER	ASSIGNED CODE NO.		
CAMERA LOCATION	ROLL NO.	PROJECT NO.	SOUNDMAN	ASSIGNED CODE NO.		

MAG. SERIAL NO.	FOCAL LENGTH	FPSOR SHUTTER SP.	STOP	FILTER	LOAD	COUNTER Before	COUNTER After	TIME Start	TIME Stop

FILM TRADE NAME	LIGHT	BRIGHT	CLOUDY	HAZY	DULL	DUSTY	CYCLE RATE	INSTALLATION AZIMUTH	DEG +	DEP —
	Type Film	BW 16MM	COL 16MM	BW 35MM	COL 35MM	BW Still	COL Still			

SCENE & TAKE NO.	LENS	f/Stop	FOOTAGE Dial	FOOTAGE Scene	DESCRIPTION OF SEQUENCES

COPY NO. 1

Fig. 2.2—Photography caption-sheet form.

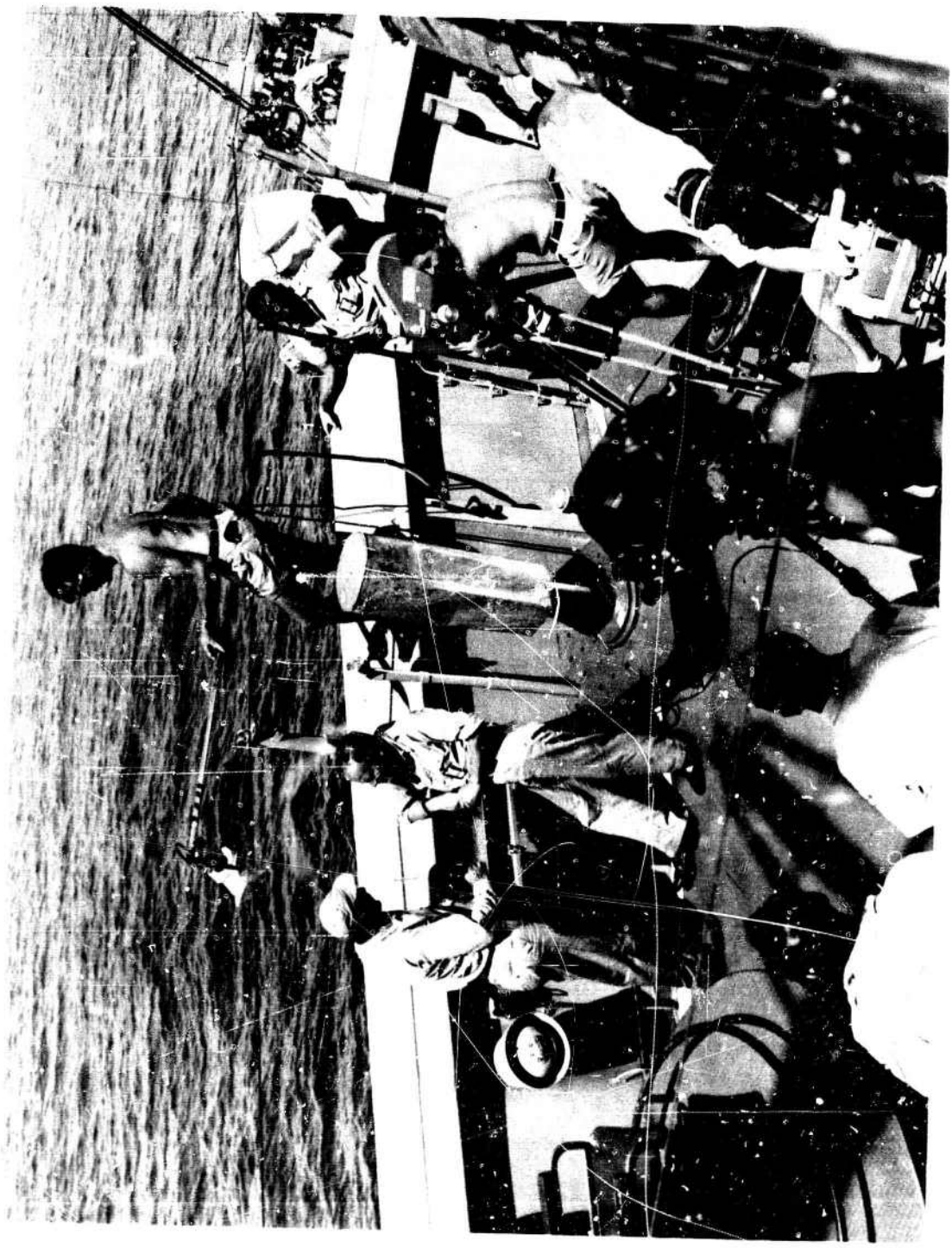

Fig. 2.3—Camera sound crew on location aboard USS Estes.

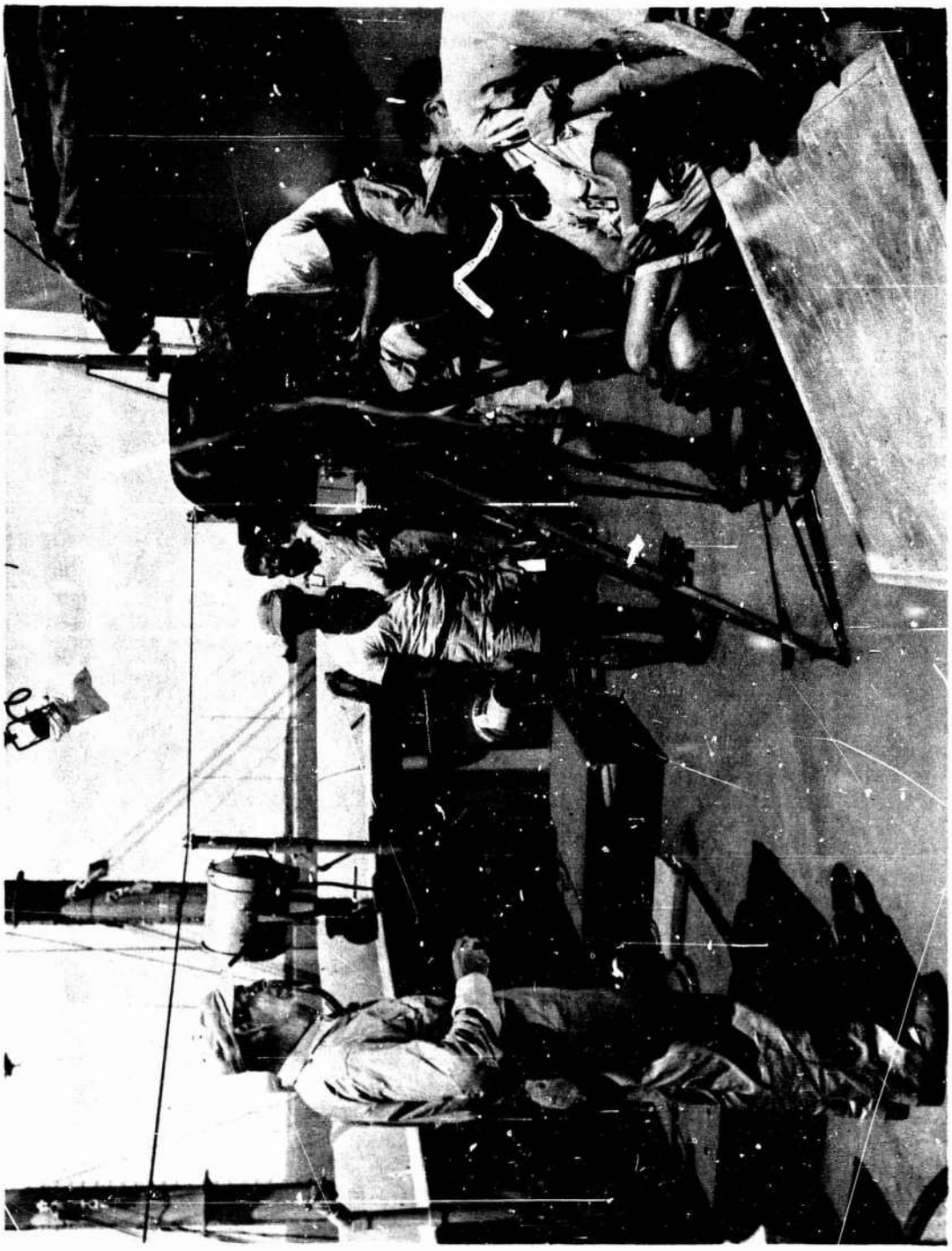

Fig. 2.4—Camera sound crew on location aboard USS Estes.

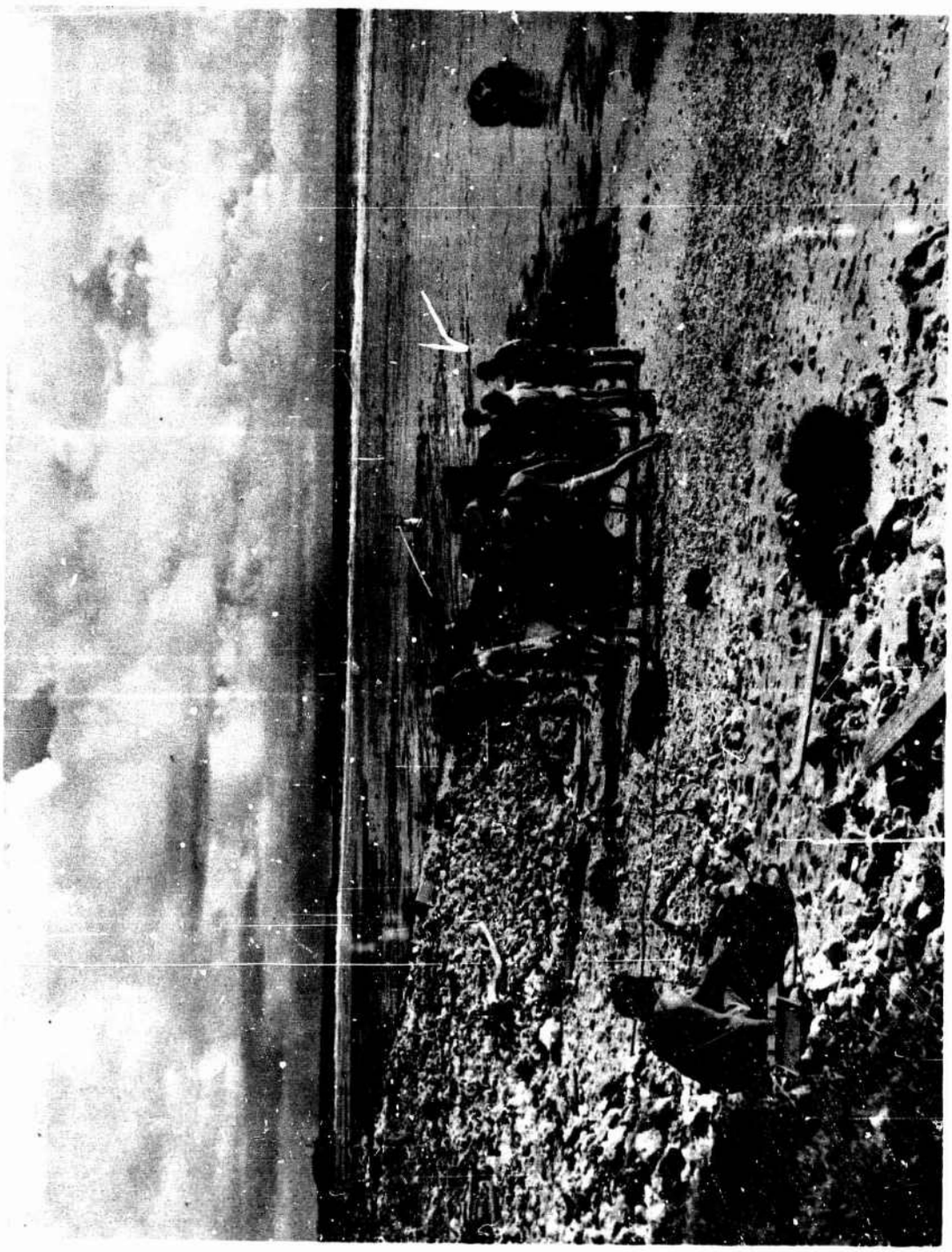

Fig. 2.5—Obtaining sound effects alongside runway at Enlwetok.

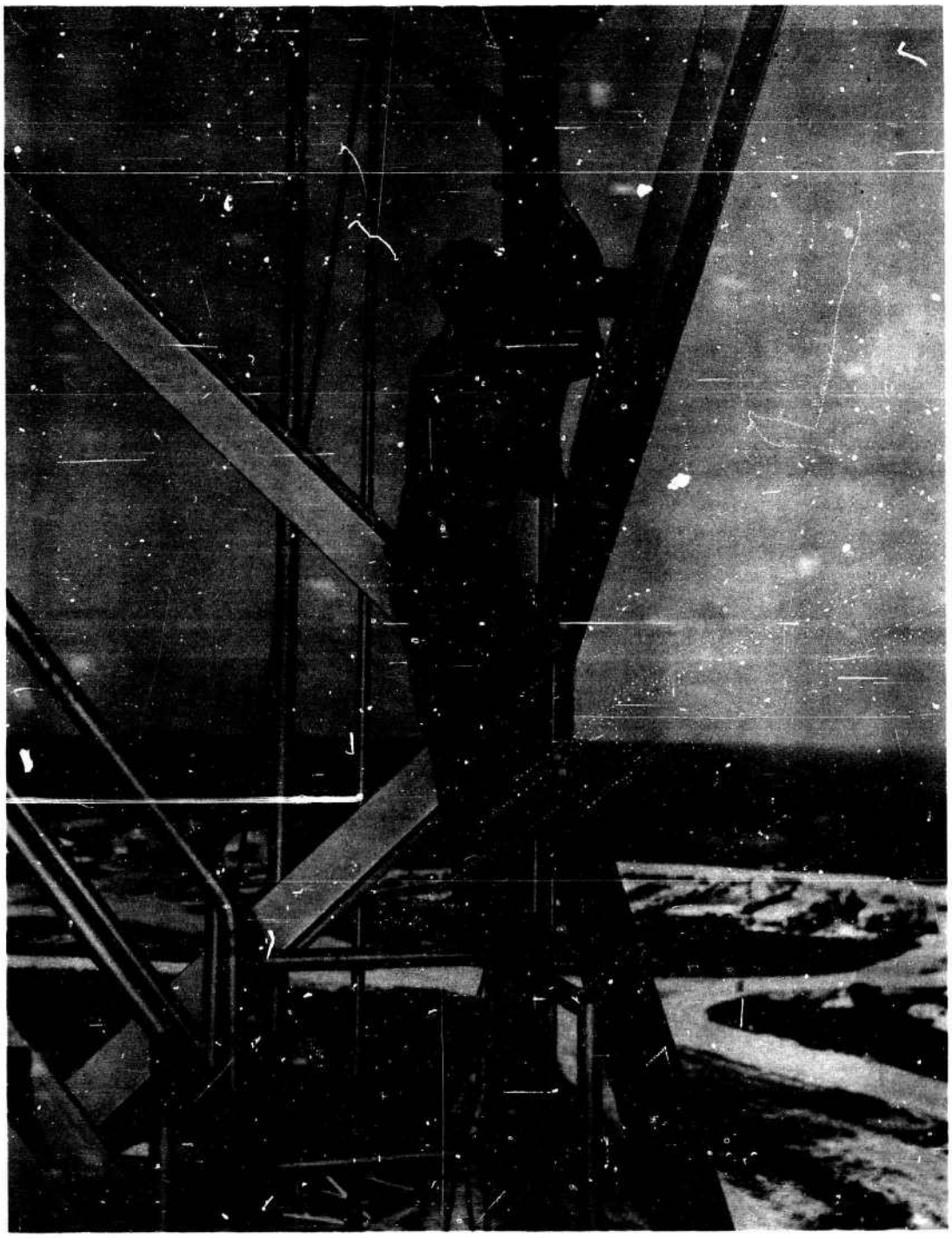

Fig. 2.6—Still photographer covering King detonation from tower on Parry Island.

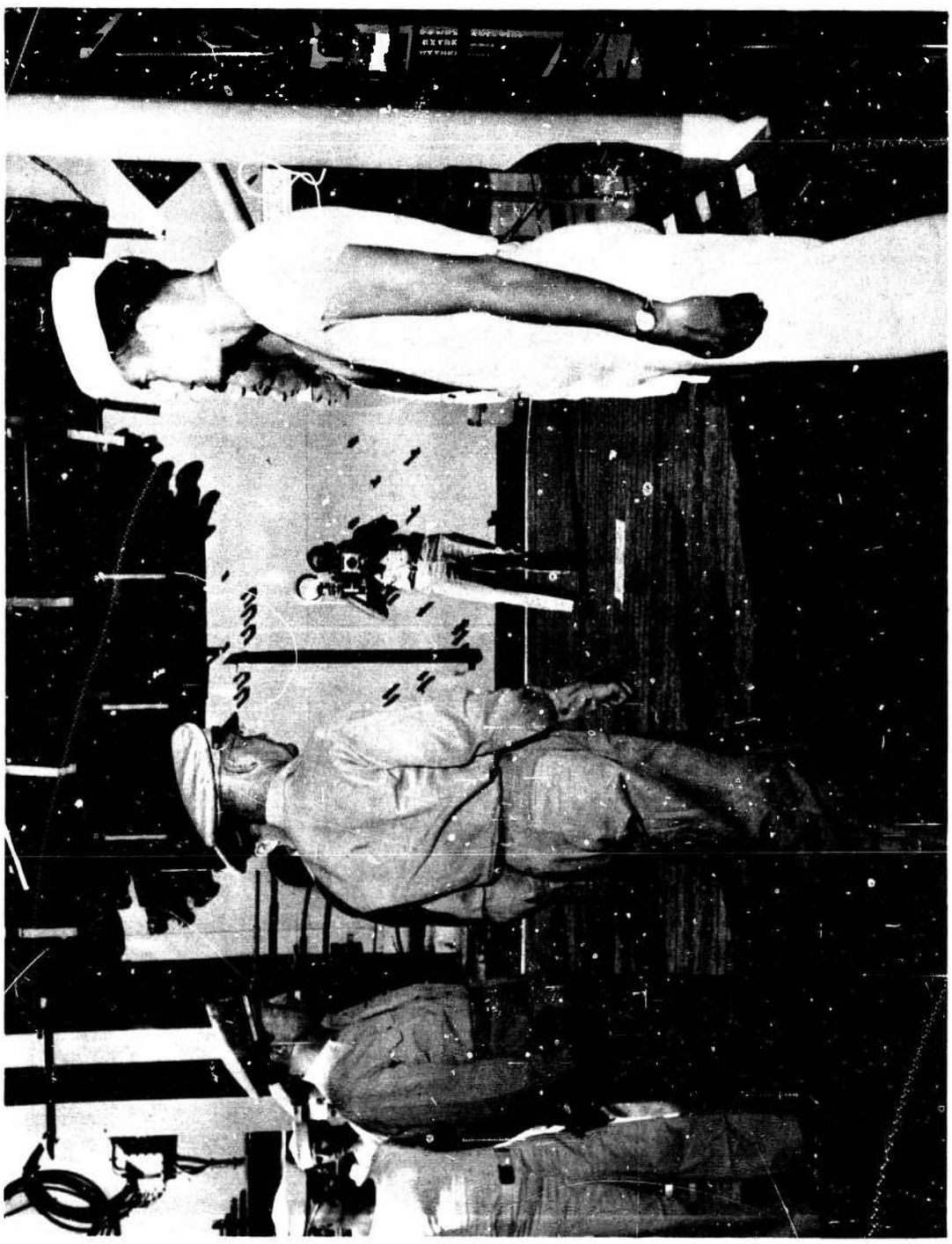

Fig. 2.7—Still photographer covering inspection by General Clarkson, Commander, JTF 132.

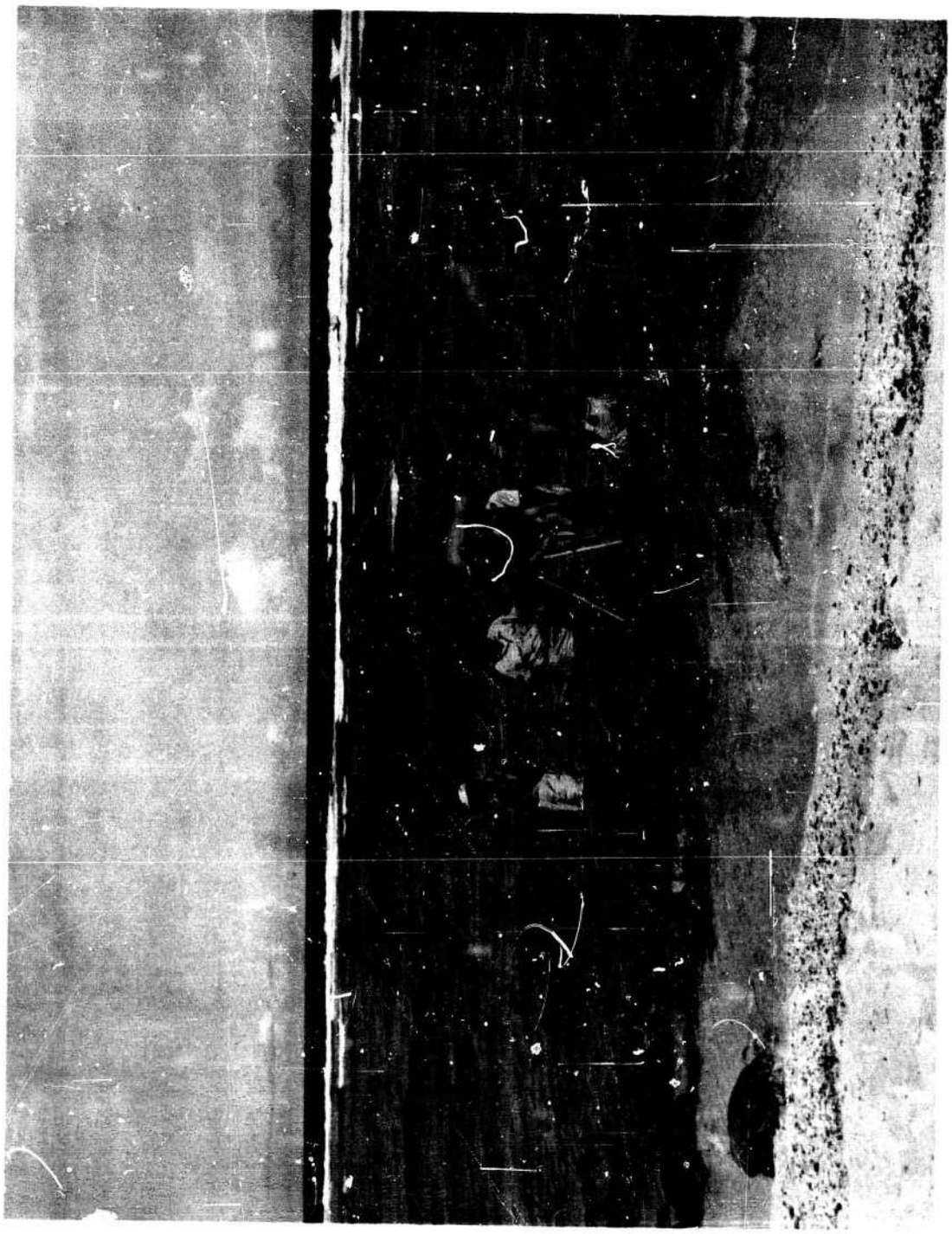

Fig. 2.8—Camera sound crew during location shooting on beach at Enlwetok.

Fig. 2.9—Location shooting at Enlwetok.

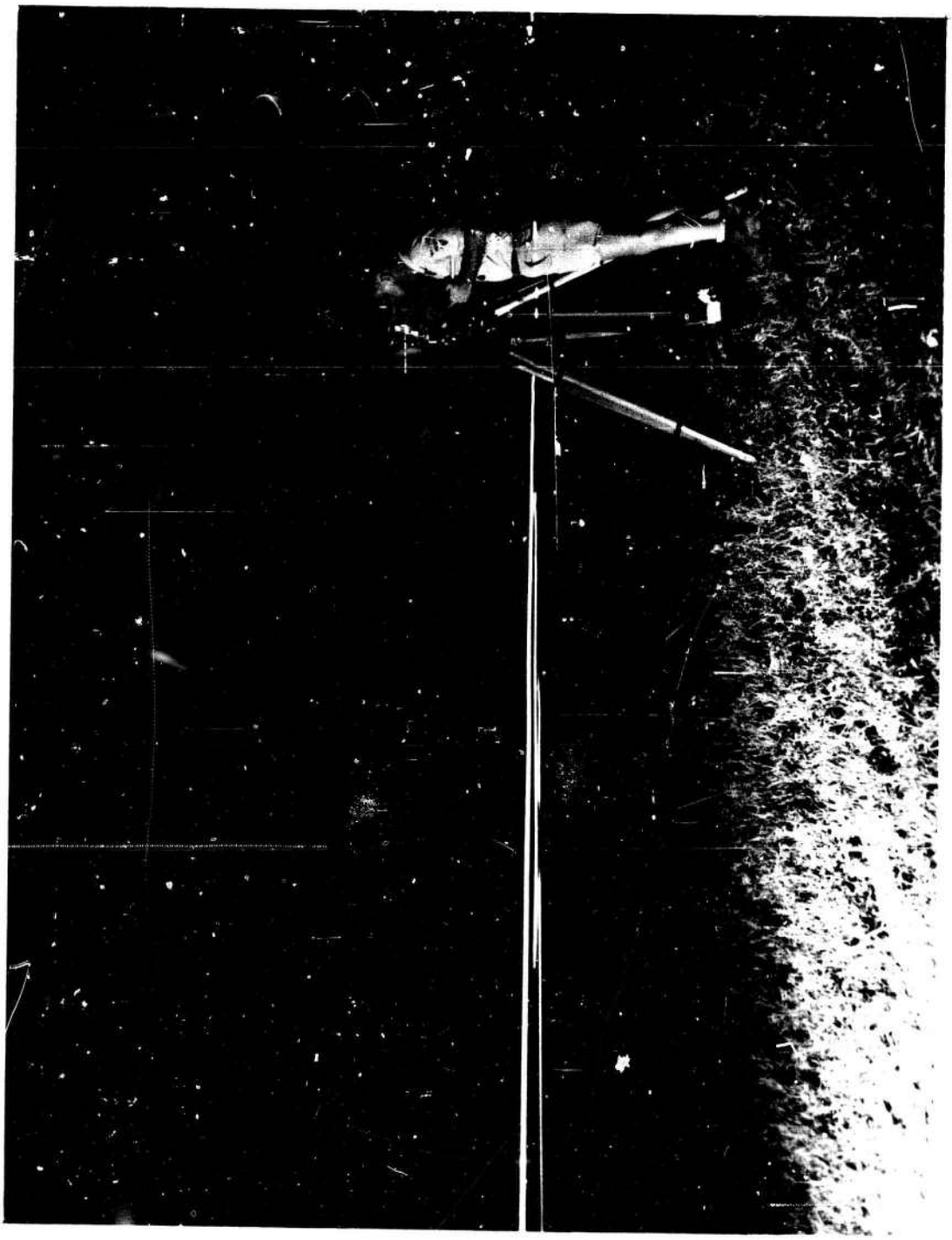

Fig. 2.10—Cameraman covering night take-offs on Kwajalein.

Fig. 2.11—Installation of auto-remote camera.

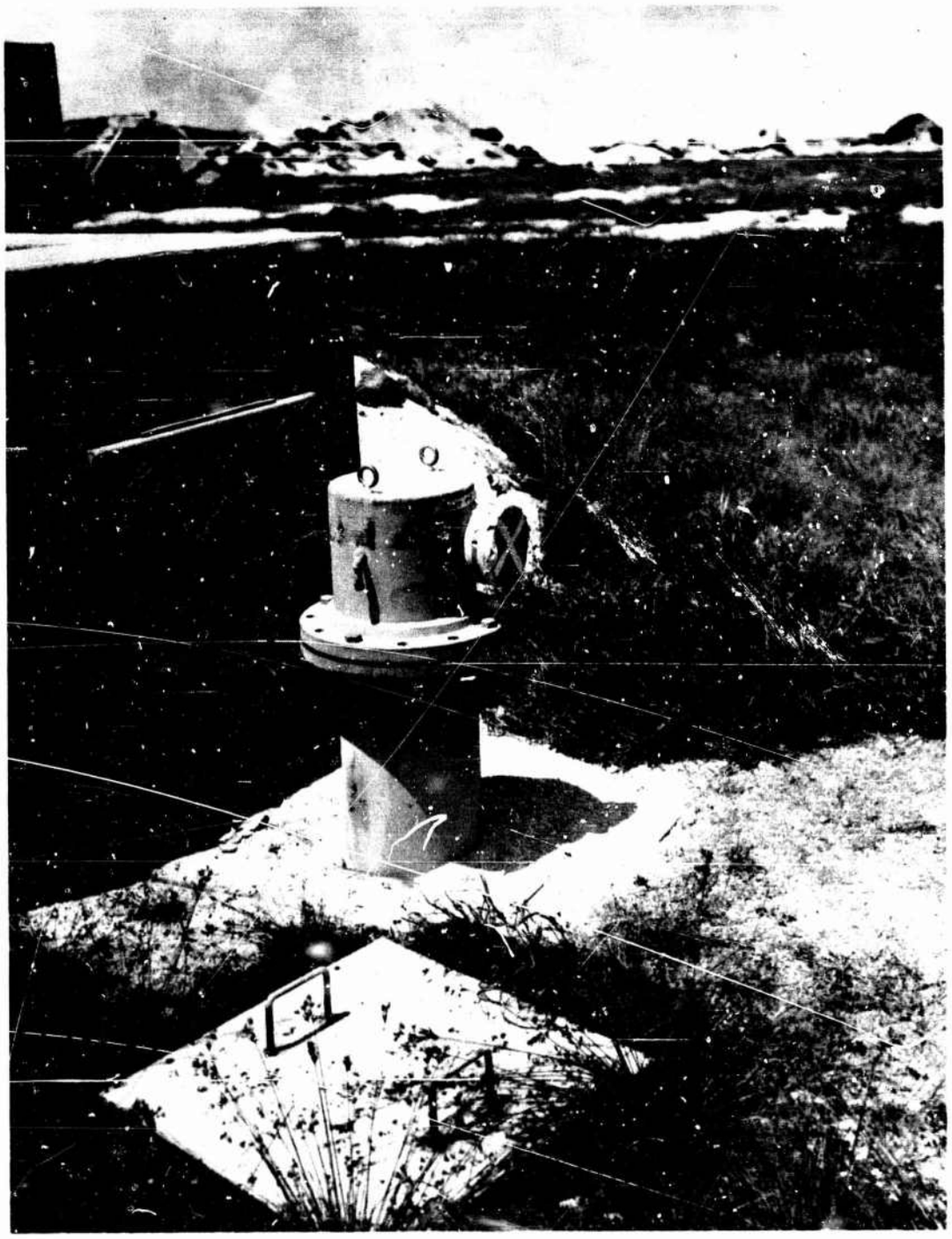

Fig. 2.12—Auto-remote camera installed in special casing on Engebi Island.

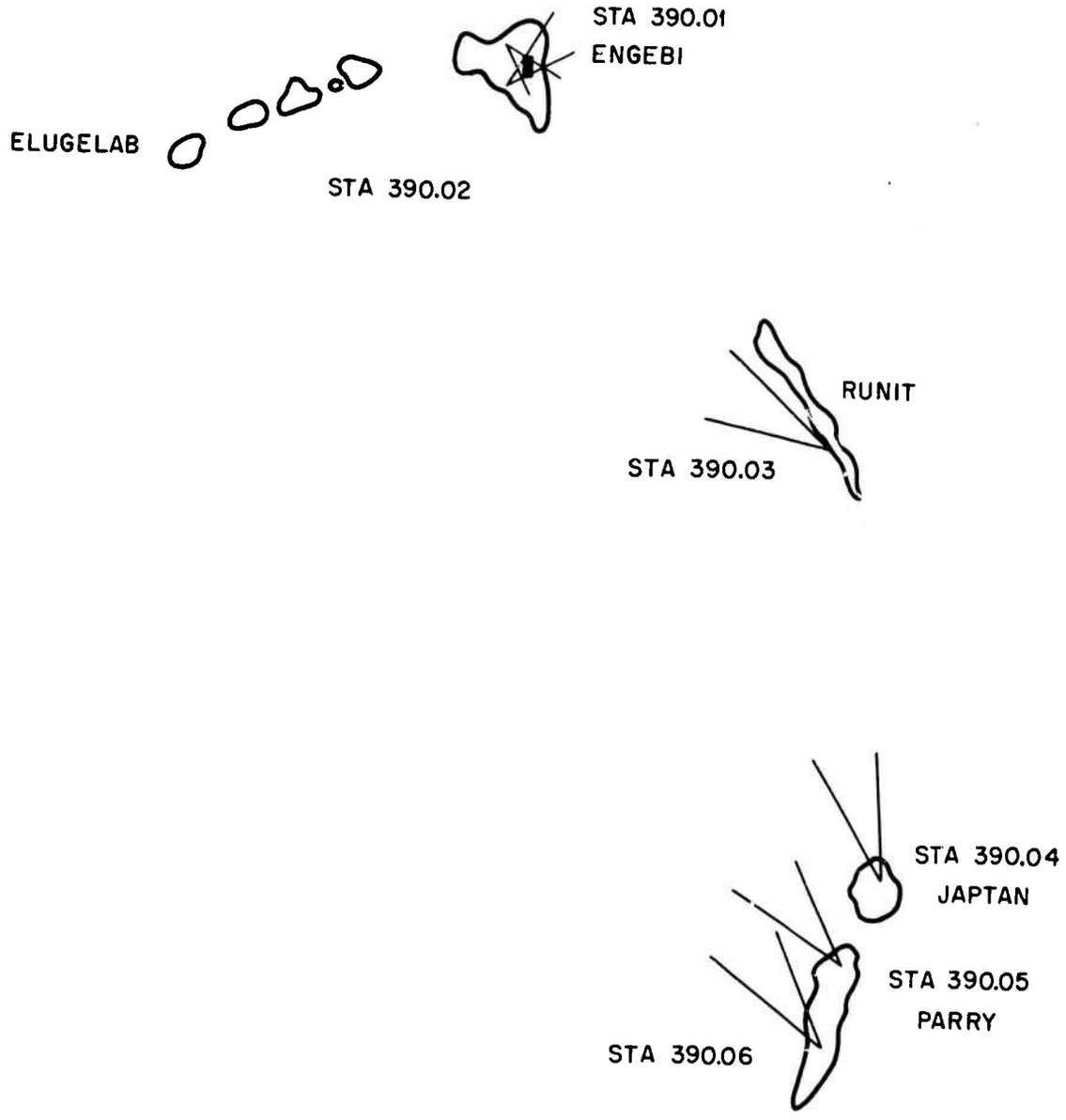

Fig. 2.13--Location of auto-remote camera stations for Mike Day.

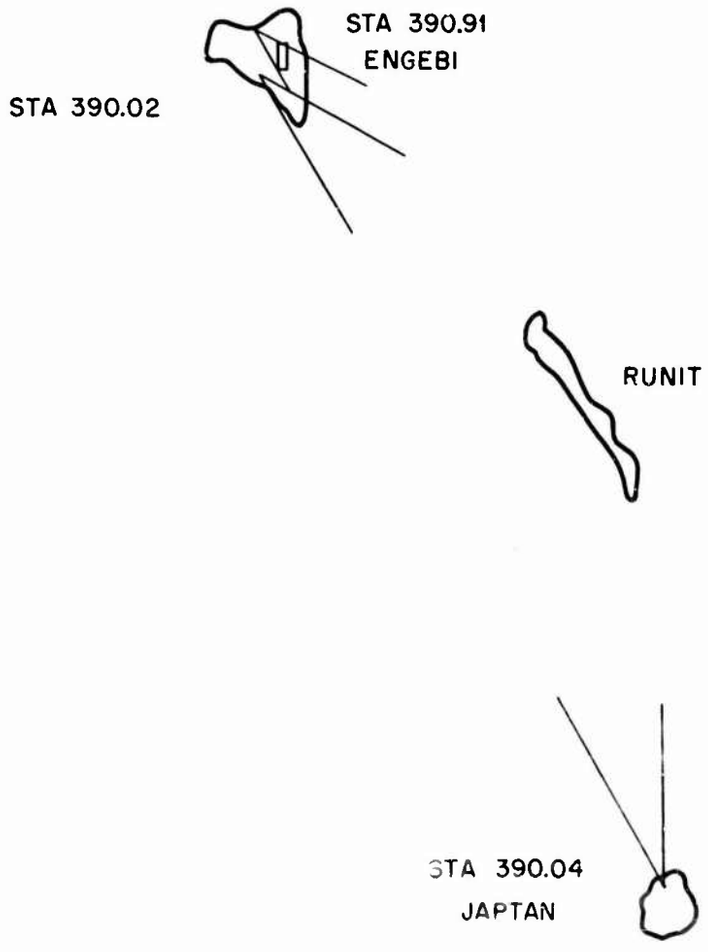

Fig. 2.14—Location of auto-remote camera stations for King Day.

Station 390.02, Engebi: One 16-mm camera was pointed at the south and west sides of the multistory building on Engebi. This camera, triggered by a photocell and loaded with a special panchromatic film, emulsion type 918, operated successfully on the Mike test. For the King test, the camera was turned to cover the burst; it failed to operate.

Station 390.03, Runit: One 16-mm camera, pointed at the dock on Runit and also covering the burst, was triggered by a photocell and was loaded with special panchromatic film, emulsion type 918. It operated successfully on the Mike test. This camera station was removed for the King test.

Station 390.04, Japtan: One 16-mm camera was pointed at the burst, shooting through the trees on Japtan. This camera was triggered by a photocell and was loaded with Eastman color negative. It failed to operate on both the Mike and the King tests.

Station 390.05, Eniwetok: One type K-25 aircraft camera was pointed at the burst from the north tip of Eniwetok. This camera, triggered by a photocell and loaded with Ektachrome film, failed to operate on the Mike test. This installation was removed for the King test.

Station 390.06, Eniwetok: One 16-mm camera was pointed at the beach club and the burst. It was triggered by a photocell and was loaded with Eastman color negative. This camera did not operate on the Mike test and was removed for the King test.

2.2.6 Aerial Practice Missions

C-54 practice missions for Mike were held on 14 and 18 October. Inasmuch as a number of flight-crew personnel were on Eniwetok, the C-54's landed there on the dress-rehearsal mission of 18 October to pick up these crew members. Landings were made after the mission to drop these crew members off before the aircraft returned to base at Kwajalein. The 18 October mission was cut short by engine trouble in the RB-50.

Similar practice missions were flown for King Day, with all crews departing from, and returning to, Kwajalein.

2.2.7 RB-50 Mapping Missions

On the first mapping mission, flown on 20 October, approximately 50 per cent of the low-altitude mosaic coverage of Eniwetok was obtained. In addition, low-altitude vertical coverage of the Mike site was obtained.

On 23 October all aerial-mosaic photography of Eniwetok, plus low-altitude oblique coverage of the Mike site, was completed. However, this film was destroyed in a fire which resulted during the landing roll of this aircraft at Eniwetok (see Figs. 2.15 and 2.16). The entire aircraft and all film were completely destroyed.

One C-54 was dispatched on 25 October to reshoot the low-altitude oblique coverage of the Mike site. This was successfully completed.

The replacement RB-50 arrived at Kwajalein on M−1 day but was unable to participate in this operation because of mechanical difficulties.

On 2 November the replacement RB-50 proceeded to Eniwetok and accomplished aerial-mosaic photography at this atoll at 1500 and 2500 ft. This photography was incomplete, however, because of poor light conditions. Low-altitude vertical post-blast photos of suitable quality of the Mike detonation area were obtained on this mission.

On 9 November this aircraft flew a mission which resulted in approximately 40 per cent completion of the project.

On 20 November the RB-50 proceeded to Eniwetok and completed the aerial-mosaic photography of that area. From here it proceeded to Bikini and completed the mapping mission of that atoll.

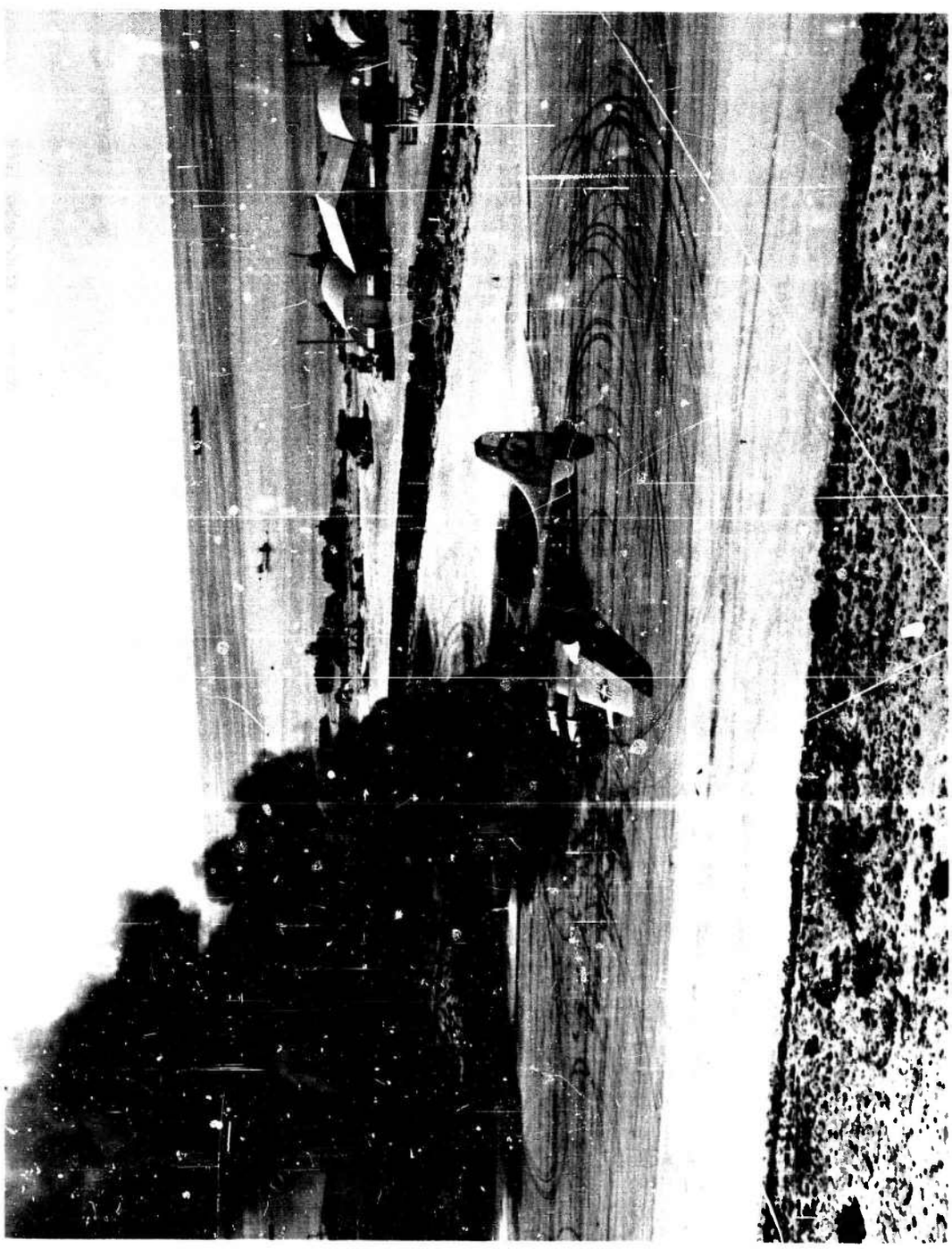

Fig. 2.15—RB-50 photographic aircraft on fire at Eniwetok, 23 October 1952.

Fig. 2.16—Close-up view of RB-50 photographic aircraft destroyed by fire, Eniwetok, 23 October 1952.

2.3 MIKE DAY OPERATIONS

2.3.1 Aerial

Three C-54 photographic aircraft proceeded to the target area and orbited zero point at 10,000, 12,000, and 14,000 ft at a slant range of 50 nautical miles (see Fig. 2.17).

The RB-50 aircraft was unable to take off on this mission because of mechanical difficulties.

Considerable cloud cover was encountered in the target area; however, acceptable photography was obtained.

Camera installations and types were as illustrated in Fig. 2.18.

Following detonation, C-54 No. 5575 descended to 1000 ft to perform low-altitude photography of the surface ships at the rendezvous point, as called for in the script. Following this, it proceeded to the target area, where it made several low-altitude survey flights over the crater area until excessive radiation fall-out was encountered. At this point the pilot turned away and returned to the base at Kwajalein. However, the initial fall-out encountered was sufficient to fog all film and preclude all members of the crew from participating in King Day operational flights. The circumstances surrounding this radiation exposure were made the subject of a separate report submitted to the Commander, TG 132.1, in November 1952.

Data as to footage exposed, additional camera locations, and camera malfunction are shown in Table 2.2.

2.3.2 Remote Cameras

Considerable difficulty in the way of inoperative cameras was encountered with the remote camera installations. This was largely attributable to the fact that the photocell triggering mechanism was set so as to prevent triggering by flashes of lightning during the night preceding zero hour. Because of this the photocells would not trigger unless activated by a sharp increase in light intensity, which was the predicted light-intensity behavior for Mike. However, the actual behavior was apparently not as predicted. The Mike light intensity was comparatively slow in building up; therefore, the photocells did not respond.

Camera locations are indicated in Fig. 2.13.

2.4 KING DAY OPERATIONS

2.4.1 Aerial

Three C-54 aircraft proceeded from Kwajalein and orbited the target area until detonation time. Stations were at 10,000, 12,000, and 14,000 ft, respectively, at a slant range of 15 nautical miles (see Fig. 2.19).

The RB-50 aircraft proceeded from Kwajalein and orbited the target area at 22,000 ft and 30 nautical miles slant range. It was positioned so as to be heading into the blast at zero hour in order that the photographer in the nose could bring cameras to bear on the detonation (see Fig. 2.20). Weather conditions at zero hour were good, and excellent photographic coverage of all phases of the explosion were obtained. Total footage and camera malfunction data were as noted in Table 2.3.

Camera placement in C-54 aircraft was as shown in Fig. 2.18.

2.4.2 Remote Cameras

An additional airborne camera was installed in the bomb bay of the drop B-36 for recording the bomb drop. This camera failed to function, presumably because of the low temperature at the bombing altitude in the unpressurized bomb bay.

King Day remote installations were as noted in Fig. 2.14.

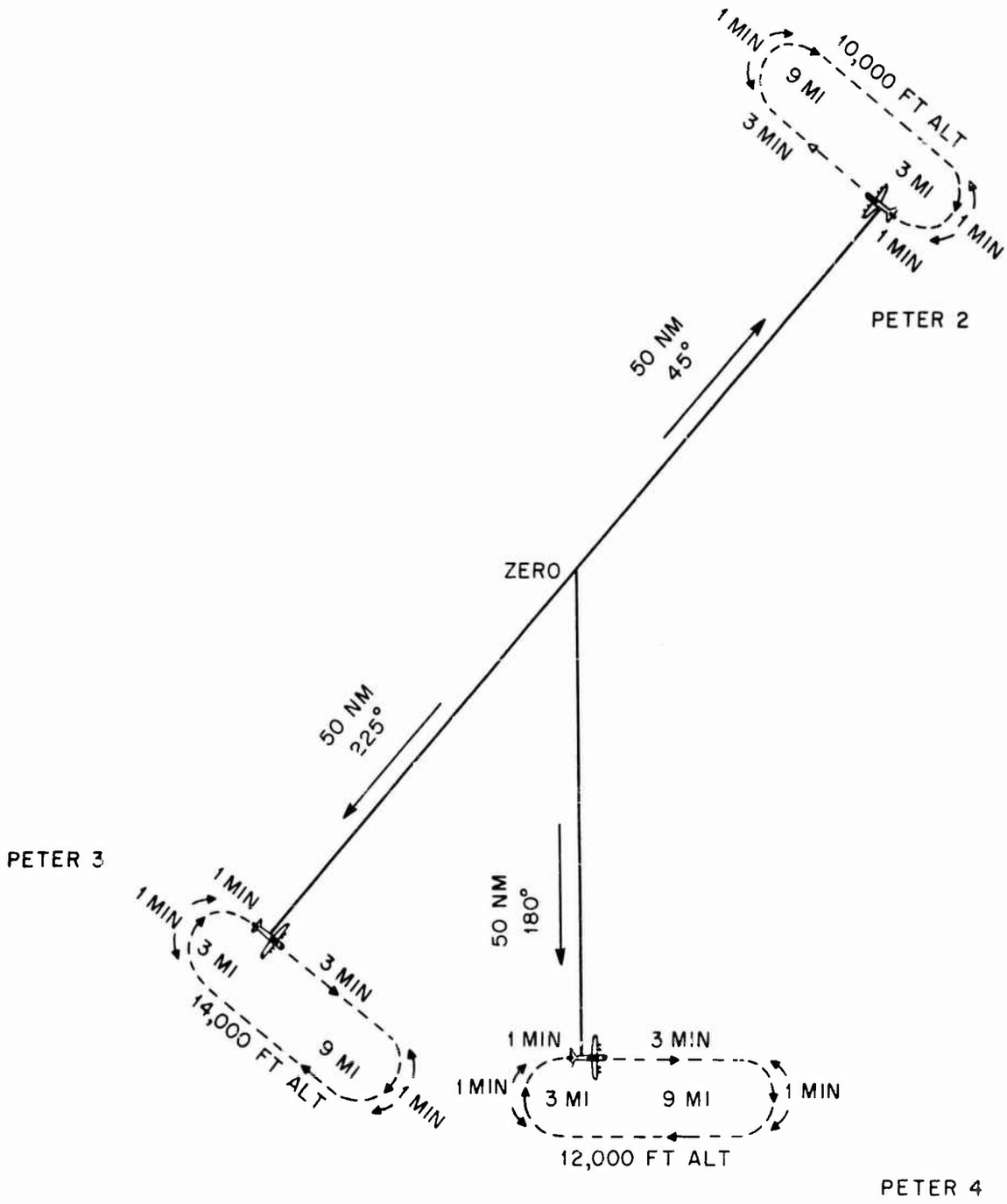

Fig. 2.17—C-54 photographic-aircraft flight patterns for Mike Day. ↕ = aircraft position and altitude to point "Z" at H-hour. True airspeed 180 sm/hr.

Table 2.2—PHOTOGRAPHY OPERATIONS SCHEDULE FOR MIKE DAY, T

LOCATION	CAMERA TYPE	CAMERA NO.	FILM TYPE	1st LOAD	2nd LOAD	FILTER	F STOP	START	FR. PER SEC.	FILM NO.	AMOUNT EXPOSED 1st LOAD	AMOUNT EXPOSED 2nd LOAD	LENS	MALFU
PETER 4 AIRCRAFT 5500	MAURER	214	KCD	400'		88	VARIED	-10 SEC.	24	RKF-120	400'		1"	
" "	K-28	699 477	EKTACHROME	ROLL	ROLL	HF-3 HF-5	F-5.6	+5"	AT WILL 1/250	RPW-10	20'		6 3/8"	
" "	K-24	109 144	"	"	"	HF-3 EF HF-5	"	"	1 PER 10 SEC. 1/450	DPY-21	40'		12"	
" "	"	160 369	"	"	"	HF-3 EF HF-5	F-5	"	" "	DPY-32	"		20"	
" "	"	110 139	R&W	"	"	K-2	"	"	" " 1/900	DLA-26	56'		12"	
" "	"	162 216	"	"	"	"	F-5.6	"	" "	DLA-25	"		20"	
" "	K-17	44-190 571	EKTACHROME	75' ROLL		HF-2 EF HF-5	F-5	"	RUNAWAT	APB-37	75'		12"	
" "	MAURER	222	KCD	400'	400'	83	F-2	"	32	RKF-86	400'		4"	VI
" "	E-1A	924	"	"	"	"	"	"	"	RKF-139	"		15 mm	
" "	EASTMAN H.S.	1629	KCD	100'		"	F-22	-1"	1000	RKC-110	100'		60 mm	
" "	MAURER	201	"	400'	400'	"	F-28	+5"	32	RKF-111	400'		63 mm	
" "	MITCHELL 35	907	BACK X	1000'	1000'	A-1	"	"	48	MCG-2	1000'		6"	
PETER 3 AIRCRAFT 5688	MAURER	240	KCD	400'	400'	83	F-2.7	-10"	32	RKF-121	400'		15 mm	
" "	R-25		EKTACHROME	ROLL	ROLL	HF-3 HF-5	F-4.5 F-8	+5"	AT WILL 1/225 1/500	RPW-22	20'		6 3/8	
" "	X-24	111 692	SUPER XX	"	"	K-2	F-5		1 PER 10 SEC. 1/900	DLA-12	15'		12"	Y
" "	"	161 928	EKTACHROME	"	"	HF-3 HF-5	F-2.5	"	1 PER 10 SEC. 1/450	DPT-21	40'		7"	
" "	"	162 151	SUPER XX	"	"	K-2	F-5	"	1 PER 10 SEC. 1/900	DLA-27	56'		12"	
" " " "	" "	160 291	EKTACHROME	"	"	HF-3 HF-5	"	"	1 PER 10 SEC. 1/450	DPY-16	40'		7"	
" "	K-17	43 779	"	200 EXP. ROLL		"	"	"	RUNAWAY 1/225	APB-35	75'		12"	
" "	MAURER	230	KCD	400'	400'	83	VARIED	"	24	RKF-83	400'		1"	
" "	B-1	866	"	"	"	"	F-1.9	"	32	RKF-88	"		25 mm	
" "	EASTMAN H.S.	1603	"	100'		"	F-22	-1"	1900 2100	RKC-113	100'		"	
" "	MAURER	221	"	400'	400'	"	F-4.5	+5"	48	RKF-81	337'		2"	
" "	MITCHELL 35	898	BKG X	1000'	1000'	A-2	F-45	+5"	32	MCG-1	1000'		4"	
PETER 2 AIRCRAFT 5575	MITCHELL "	187	KCD	400'		83	F-2.7	-10"	32	RXF-125	400'		1"	
" "	K-25	52 930	SUPER XX	ROLL	ROLL	25A	VARIED	+5"	AT WILL	BLW-10	20'		6 3/8	
" "	K-24	38 166	EKTACHROME	"	"	COMP	F-2.5	"	1 PER 10 SEC.	DPY-5	40'		7"	
" "	"	21 606	B&W	"	"	A-2	F-5.6	"	1 PER 10 SEC. 1/900	DLA-28	56'		20"	
" "	"	110 314	EKTACHROME	"	"	COMP	"	"	1 PER 10 SEC. 1/450	DPY-25	40'		"	
" "	"	109 199	SUPER XX	"	"	A-2	F 2.5	"	1 PER 10 SEC. 1/900	DLA-38	0		7"	
" "	K-17	44 434	TRIFLE X FAN	200 EXP. ROLL		"	F-8	"	RUNAWAT	ALD-62	200'		12"	
" "	MAURER	225	KCD	400'	400'	R3	F 2.7	"	24	RKF-133 RKF-134	400'	400'	63 mm	
" "	R-1A	859	"	"	"	83	F 4	"	64	RKF-135 RKF-136	"	"	3"	
" "	FASTAX	16 106	"	100'		"	F-22	-1"	1500	RKC-103	100'		10"	
" "	MAURER	237	"	400'	400'	"	F-2.7	+5"	32	RKF-138	400'		63 mm	
	MITCHELL 35	911	BKG X	1000'	1000'		F-4.5	"	48	MCG-[illegible]	[illegible]	1000'	132 mm	
PETER 1 AIRCRAFT RB-50	B-1A	834	KCD	5-100'		"		"	32				2"	
AIRCRAFT R-29 TANKER	"	856	"	"		"	VARIED	"	48	RKC-50	31'		2"	
"	"	854	"	"		"	"	"	"	RKC 145 RKC 147	100' 100'	100'	2"	
XWAJ.	ECLAIR MITCHELL	20 151	SUPER XX 35 mm KCD	400 "	400' "	"	F-2 6.3	GRND "	24 "	MLT-5 & 6 RKF-75	400' "	400' 0	50mm "	
"	ECLAIR	50	SUPER XX 35 mm KCD	400 "	400'	"	F-2 VARIED	" "	" "	RKF-42 RKF-40	0 400'	MLF-7 400'	VARIED	
"	R-1A	834	XCD	100'		"	F-4 F 5.6	"	"	RXC-192	100'		15 mm 25 mm	
"	ECLAIR	51	SUPER XX XCD	400' "	400' "	"	F-2 VARIED	" "	" "	MLT-8&9 RXF-60	400' "		VARIED "	
"	C-6	859 133	SUFREME	PACX 12 EXP.	PACK 12 EXP. PACX 12 EXP.	NONE	VARIED	"	STILL	FAX-69 FAK-70 FAK-71	12 EXP. " "		135 mm	
CURTISS	R-1		XCD	100'	4 X 100'	83	VARIED	-5"	24		100'	40'		
"	ANSCO-REFLEX		B&W	36 EXP.		NONE	"				36 EXP.			
"	R-1A	318	XCD	100'		93	6.3	-5"	24	RXC-140	100'		1"	
RENDOVA	"	850	"	"		83	VARIED	-5"	"	RKC-148	100'		1"	
"	"	844	"	"		"	"	-10"	"	RKC-166	100'		1"	
SHANKS	"	156	"	"		"	2.8	-5"	"	RXC-123	100'		ZOOM	
ESTES	ECLAIR	52	"	400'		83	2	-3"	"	RKF-69	400		50 mm	

—PHOTOGRAPHY OPERATIONS SCHEDULE FOR MIKE DAY, TU 9

nd LOAD	FILTER	F STOP	START	FR. PER SEC.	FILM NO.	AMOUNT EXPOSED 1st LOAD	2nd LOAD	LENS	MALFUNCTION	REASON	REMARKS
	88	VARIED	-10 SEC	34	RXF-120	400'		1"			
ROLL	HF-3 HF-5	F-5.6	+5"	AT WILL 1/250	RFW-10	20'		6 3/8"			
"	HF-3 HF-5 EF	"	"	1 PER 18 SEC. 1/450	DPY-21	40'		12"			STICKING SHUTYER
"	HF-3 HF-5 EF	F-5	"	" "	DFY-33	"		30"			" "
"	X-3	"	"	" " 1/900	DLA-26	56'		13"			
"	"	F-5.6	"	" "	DLA-25	"		20"			
	HF-3 HF-5 EF	F-5	"	RUNAWAY	APR-37	75'		13"			
400'	88	F-3	"	32	RKF-86	400'		4"	YES	FILM JAM (CLUTCH)	
"	"	"	"	"	RKF-139	"		15 mm	"	" "	
	"	F-33	-1"	1000	RKC-110	100'		60 mm			
400'	"	F-28	+5"	33	RKF-111	400'		63 mm			
1000'	A-1	"	"	48	MCG-2	1000'		6"			
400'	88	F-2.7	-10"	32	RKF-131	400'		15 mm			
ROLL	HF-3 HF-5	F-4.5 F-8	+5"	AT WILL 1/225 1/500	RPW-22	20'		6 3/8			
"	X-3	F-5	"	1 PER 10 SEC. 1/900	DLA-12	15'		12"	YES	MAGAZINE AT 15'	FILM JAM
"	HF-3 HF-5	F-3.5	"	1 PER 10 SEC. 1/450	DPY-31	40'		7"	"		LAST PART STICKING SHUTYER
"	X-3	F-5	"	1 PER 10 SEC. 1/900	DLA-37	56'		13"			
"	HF-3 HF-5	"	"	1 PER 10 SEC. 1/450	DFY-16	40'		7"			
	"	"	"	RUNAWAY 1/225	AFR-35	75'		12"			
400'	88	VARIED	"	34	RXF-83	400'		1"			
"	"	F-1.9	"	33	RKF-80	"		35 mm			
	"	F-22	-1"	1800 3100	RXC-113	100'		"			
400'	"	F-4.5	+5"	48	RKF-81	337'		2"			
1000'	A-3	F-45	+5"	33	MCG-1	1000'		4"			
	88	F-3.7	-10"	32	RXF-126	400'		1"			
ROLL	25A	VARIED	+5"	AT WILL	RLW-10	20'		6 3/8			
"	COMP	F-3.5	"	1 PER 10 SEC.	DFY-5	40'		7"			LAST PART FOGGED
"	A-3	F 5.6	"	1 PER 10 SEC. 1/900	DLA-38	56'		30"			
"	COMP	"	"	1 PER 10 SEC. 1/450	DFY-25	40'		"			LAST PART FOGGED
"	A-3	F 3.5	"	1 PER 10 SEC. 1/900	DLA-38	0		7"	YES	CAMERA FAILURE	
	"	F-8	"	RUNAWAY	ALD-62	200'		13"			
400'	88	F 3.7	"	24	RKF-133 RXF-134	400'	400'	63 mm			
"	88	F-4	"	64	RXF-135 RKF-136	"	"	3"			
	"	F-22	-1"	1500	RXC-103	100'		10"			
400'	"	F-2.7	+5"	32	RXF-138	400'		63 mm			
1000'		F-4.5	"	48	MCG-5&6	1000'	1000'	152 mm			
	"		"	33				3"			NO MISSION AIRCRAFT ABORT
	"	VARIED	"	48	RXC-50	31'		3"			
	"	"	"	"	RXC 146 RXC 141	100' 100'	100'	3"			
400'	"	F-3 6.3	GRND "	24 "	MLY-5&6 RX1-75	400' "	400' 8	50mm "			
400'	"	F-3 VARIED	" "	" "	RXF-42 RKF-40	0 400'	MLF-7 400'	VARIED			
	"	F-4 F 5.6	"	"	RXC-192	100'		15 mm 35 mm			
400' "	"	F-2 VARIED	" "	" "	MLY-8&9 RXF-60	400' "		VARIED "			
13 EXP. 12 EXP.	NONE	VARIED	"	STILL	FAX-69 FAK-70 FAK-71	13 EXP. " "		135 mm			
100'	88	VARIED	-5"	34		100'	400'				
	NONE	"				36 EXP.					
	88	6.3	-5"	34	RKC-140	100'		1"			
	88	VARIED	-5"	"	RXC-148	100'		1"			
	"	"	-10"	"	RKC-166	100'		1"			
	"	3.8	-5"	"	RXC-123	100'		ZOOM			
	88	2	-3"	"	RKF-69	400'		50 mm			

SUMMARY OF FILM TOTALS

16 mm KCO	MOT. PIC.	9068'
35 mm B/W	"	5200'
35 mm EK	"	0
4 X 5 B/W	GROUND STILLS	36 EXP.
4 X 5 EK	" "	0
ANSCO REFLEX B/W		36 EXP.
K-20 & K-34 EK 5½ K 5½		289'
K-20 & K-34 B/W 5½ K 5½		359'
K-17 9½ K 9½ AERIAL B/W		150'
X-17 9½ X 9½ AERIAL EK		200'

2

Table 2.3—PHOTOGRAPHY OPERATIONS SCHEDULE

LOCATION	CAMERA TYPE	CAMERA NO.	FILM TYPE	FIRST - LOAD	SECOND - LOAD	FILTER	F STOP	START	FRS. PER. SEC.	FIL
PETER 4 AIRCRAFT - 5500	MAURER	214	KLO	400'		83	2.9	-30 SEC.	24	RK
" " "	K - 24	109 144	EKTACHROME	ROLL 40' "		H. F. S & 3 E. F. 398		- 10 SEC.	1 EVERY 5" 1/450	DP
" " "	" "	160 869	SUPER XX	" 56'		K - 2		" "	" " " "	DL
" " "	" "	110 139	B & W	" "		"		" "	" " " 1/900	DL
" " "	" "	162 216	"	" "		"		" "	" " " "	DL
" " "	K - 17	44 - 190571	EKTACHROME	" 75'		H. F. 5 & 3 E. F. 4 & 5		" "	RUNAWAY	AP
" " "	MAURER	222	KCO	400'		83		" "	32	RK
" " "	B - 1 A	873	"	"		"		" "	"	RK
" " "	EASTMAN H.S.	1629	"	100'		"		- 1 SEC.	1000	RK
" " "	MAURER	201	"	400'		"	8	- 10 SEC.	32	RK
" " "	MITCHELL 35	907	BACK - X	1000'		A - 1	8	" "	48	MC
PETER 3 AIRCRAFT - 5488	MAURER	240	KCO	400'		83		- 30 SEC.	32	
" " "	K - 25		EKTACHROME	40'		COMP		0 "	AT WILL	
" " "	K - 24	111 692	SUPER XX	56'		K - 2	5.6	- 10 "	1 EVERY 5 SEC.	DL
" " "	K - 24	161 928	EKTACHROME	40'		H. F. 3 & S	3.6	" "	" " " "	DP
" " "	" "	162 162	SUPER XX	56'		K - 2	S	" "	" " " "	DL
" " "	" "	160 291	SUPER XX	56		"	S.6	" "	" " " "	DL
" " "	K - 17	43 779	EKTACHROME	200'		H. F. 3 & S	8	" "	RUNAWAY	AE
" " "	MAURER	230	KCO	400'		83	6	" "	24	RE
" " "	B - 1 A	866	"	"		"	6	" "	32	RE
" " "	EASTMAN H.S.	1603	"	100'		"	6	- 1 SEC.	500	RE
" " "	MAURER	221	"	400'		83	9.S	- 10 "	48	RE
" " "	MITCHELL 35	898	BKG - X	1000'		A - 2	11	" "	32	ME
PETER 2 AIRCRAFT - 5575	MITCHELL 16	192	KCO	400'		83	2.5	- 30 "	"	RE
" " "	K - 24	38 205	SUPER XX	56'		A - 2	S. 6	- 10	1/5 1/900	DE
" " "	" "	21 606	" "	"		"	"	" "	" "	DE
" " "	" "	110 314	EKTACHROME	40'		COMP	6	" "	" 1/450	DE
" " "	" "	109 199	SUPER XX	56'		A - 2	8	" "	" 1/900	DE
" " "	K - 17	44 258	" "	200'		"	11	" "	RUNAWAY	AE
" " "	MAURER	225	KCO	400'		83	8	" "	24	RE
" " "	B - 1 A	859	"	"		"	12.S	" "	64	RE
" " "	FASTAX	16 106	"	100'		"	22	- 1 "	1500	UE
" " "	MAURER	237	"	400'		"	8	- 10 "	32	RE
" " "	MITCHELL 35	911	BKG - X	1000'		A - 2	S.6	" "	48	ME
PETER 1 AIRCRAFT RB-50	B - 1 A	709 886	KCO	100'	100'	83	S .6	" "	64	RE RE
KWAJALEIN	C - 6	847 399	ANSCO SUPREME	12 EXP	36 EXP		VARIED	- 3 HOURS		

SUMMARY OF FILM TOTALS

16 mm KCO	5400 FT.
35 mm B/W MOT. PIC.	3000 FT.
35 mm EK	0
4 X 5 B/W GROUND STILLS	48 EXPOSURES

RESTRICTED DATA

PHY OPERATIONS SCHEDULE FOR KING DAY, TU 9

TOP	START	FRS. PER. SEC.	FILM NO.	AMOUNT EXPOSED FIRST LOAD	AMOUNT EXPOSED SECOND LOAD	LENS	MALFUNCTION	REASON	REMARKS
9	-30 SEC.	24	RKF- 90	400'		1"			
	-10 SEC.	1 EVERY 5" 1/450	DPY-10	40'		12"			
	" "	" " " "	DLA- 8	56'		20"			
	" "	" " " 1/900	DLA- 7	"		12"	YES	UNKNOWN	
	" "	" " " "	DLA- 9	"		20"	"	"	
	" "	RUNAWAY	APB- 11	75'		12"			
	" "	32	RKF- 128	400'		4"			
	" "	"	RKF- 168'	"		15 mm	YES	JAM AT 237 FT.	
	-1 SEC.	1000	RKC- 49	100'		63 mm	"	CAMERA JAM	
8	-10 SEC.	32	RKF- 126	400'		"			
8	" "	48	MCG- 3	1000'		6"			
	-30 SEC.	32		400'		15 mm			
	0 "	AT WILL		40'		6 3/8 "			
6	-10 "	1 EVERY 5 SEC.	DLA- 10	56'		12"	YES	UNKNOWN	
6	" "	" " " "	DPY- 4	40'		7"			
5	" "	" " " "	DLA- 5	40'		12"			
6	" "	" " " "	DLA- 6	56'		7"			
8	" "	RUNAWAY	APB- 16	75'		12"			
5	" "	24	RKF-141	400'		1"	YES	CAMERA JAM	
5	" "	32	RKF-132	"		25 mm			
5	-1 SEC.	500	RKC- 77	100'		"			
5	-10 "	48	RKF-130	400'		2"			
1	" "	32	MCG- 7	1000'		4"			
5	-30 "	"	RKC-145	100'		1"			
6	-10	1/5 1/900	DLA-11	56'		7"			
	" "	" "	DLA 15	"		20"			
5	" "	" 1/450	DPY-20	40'		"			
8	" "	" 1/900	DLA-13	56'		7"			
8	" "	RUNAWAY	ALB-24	200'		12"			
5	" "	24	RKF- 79	400'		63 mm			
5	" "	64	RKF-127	"		3"			
2	-1 "	1500	UNKNDWN	100'		10"			GENERATDR TROUBLE
8	-10 "	32	RKF 129	400'		63 mm			" "
6	" "	48	MCG- 8	988		152 mm			" "
6	" "	64	RKC-144 RKC- 93	100' 1'	100'	1"			
IED	- 3 HOURS			12 EXP.	36 EXP.	6 3/8 "			

FT.
FT.

EXPOSURES

35 mm BDLSEY		0
K-20 & K-24 EK	5½ X 5½	160 FT.
K-20 & K-24 B/W	5½ X 5½	488 "
K-17	9½ X 9½ AERIAL B/W	200 "
K-17	9½ X 9½ " E K	150 "

RESTRICTED DAT

TA – SECRET – SECURITY INFORMATION

2

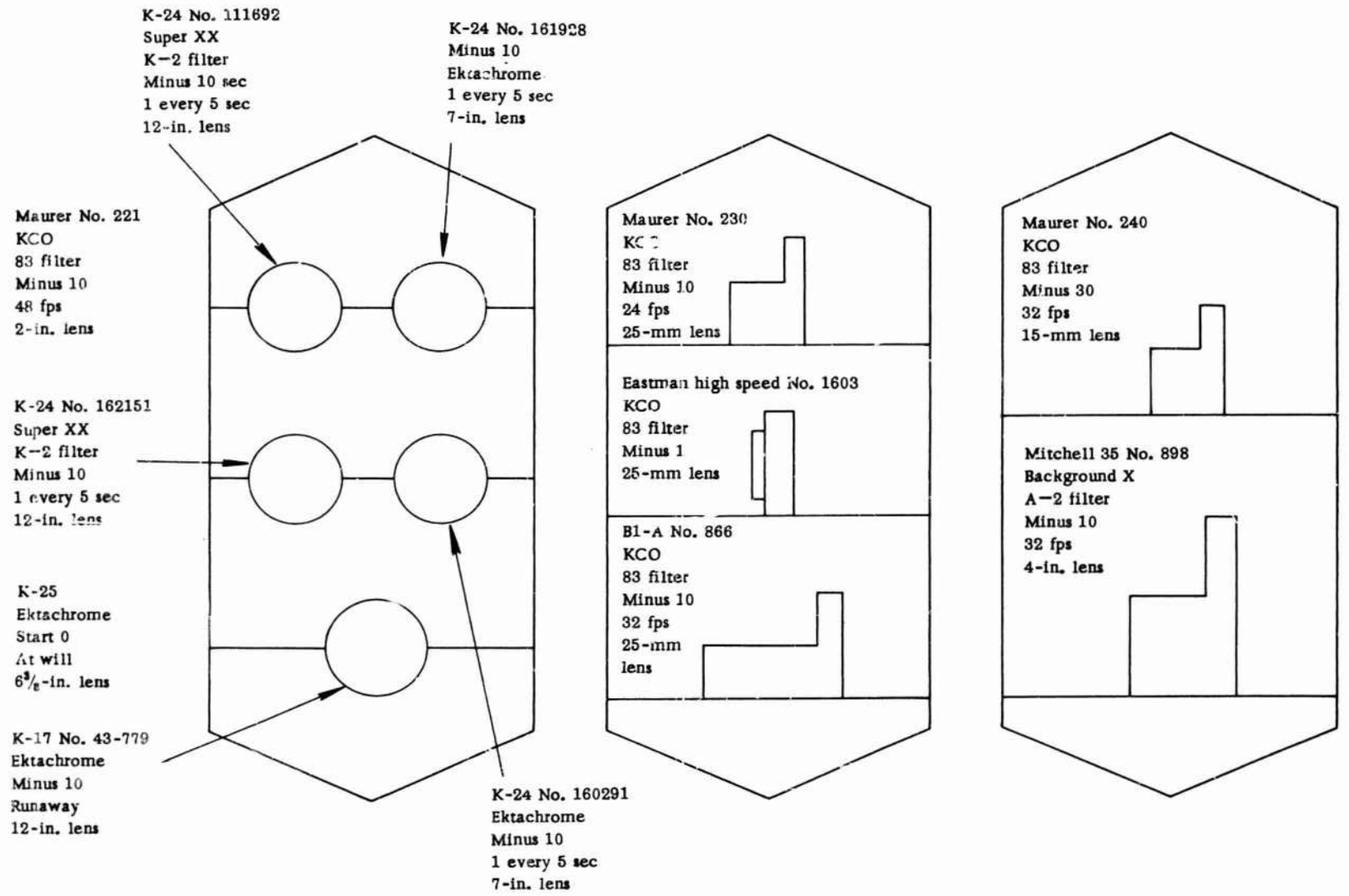

Fig. 2.18—C-54 photographic-aircraft camera installations.

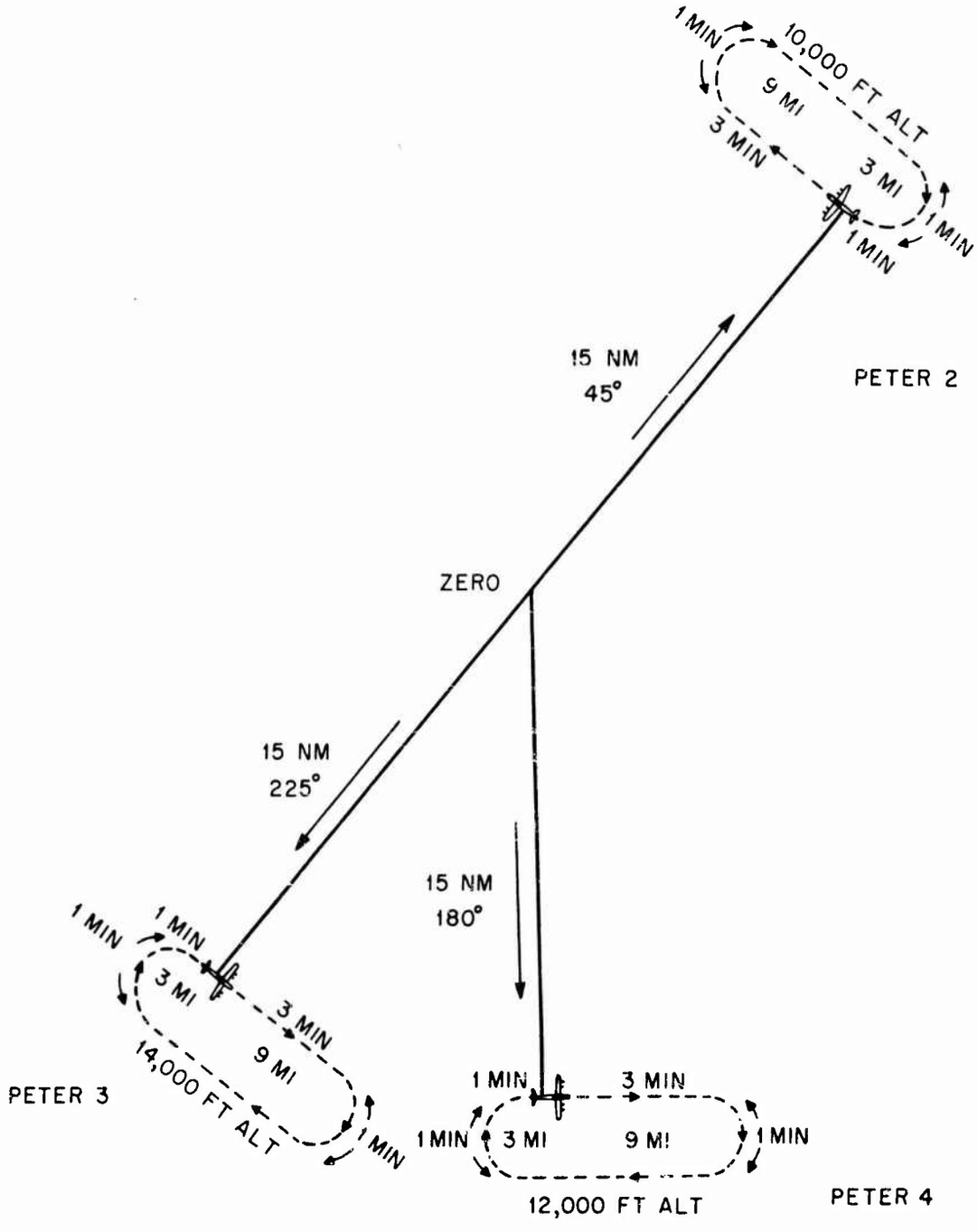

Fig. 2.19—C-54 photographic-aircraft flight patterns for King Day. ⊥ = aircraft position and altitude to point "Z" at H-hour. True airspeed 180 sm/hr.

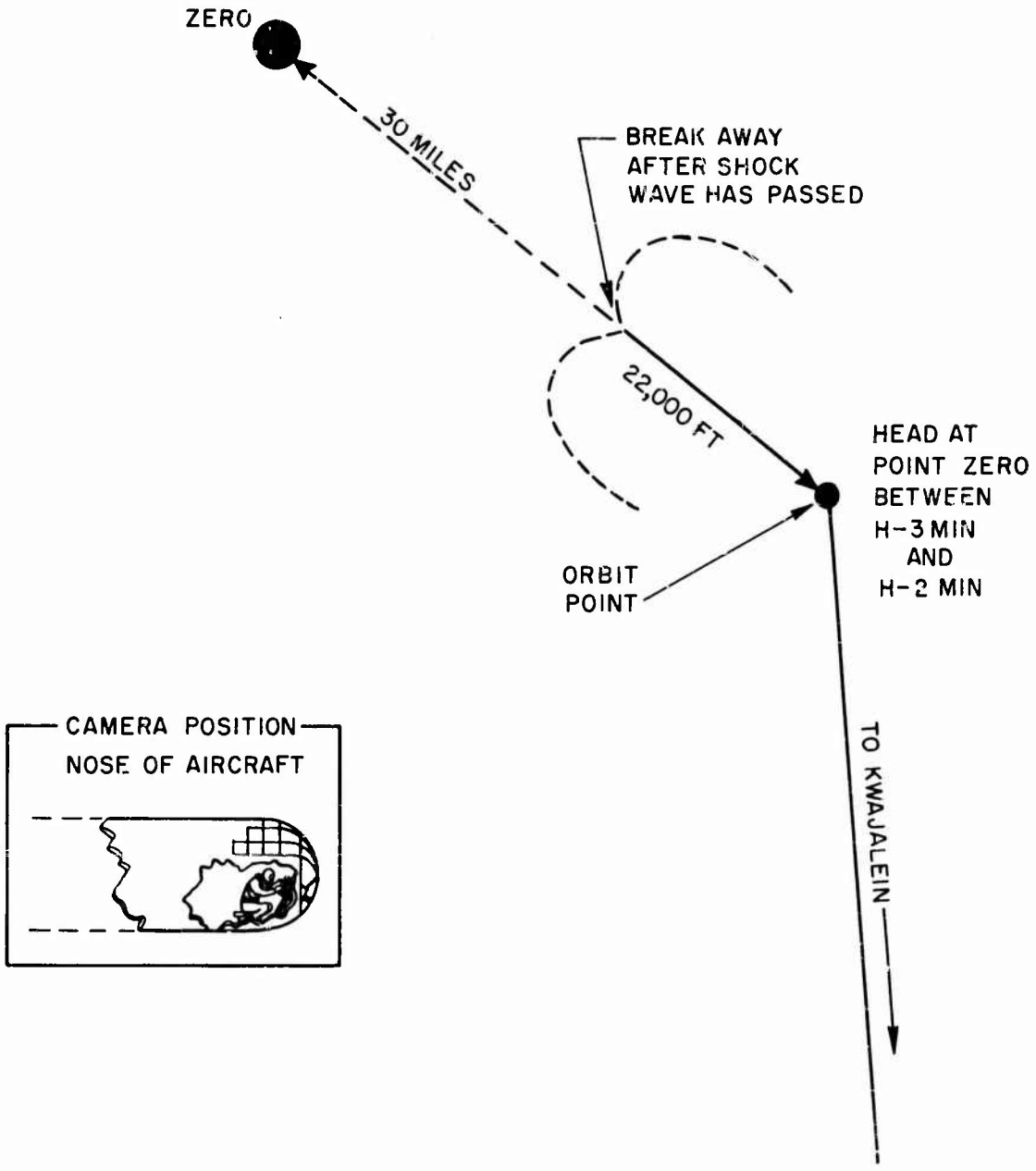

Fig. 2.20—RB-50 photographic-aircraft flight patterns for King Day.

2.5 ROLL-UP

Roll-up of personnel and equipment was as shown in Tables 1.1 and 1.2.

Roll-up of personnel and critical items of equipment was expedited through the use of two of the C-54 photographic aircraft for transportation from Kwajalein to the Zone of the Interior.

Roll-up of water-lift equipment was expedited through the use of TU 9 trailers as cargo carriers and through the use of one transportainer provided by TG 132.1. The latter unit was particularly helpful for this purpose.

CHAPTER 3

RESULTS

Full results of the TU 9 mission on Operation Ivy cannot be set down at this time inasmuch as the documentary motion picture is still in the process of preparation (editing, sound effects, etc.).

The scope of the mission is somewhat delineated in Table 3.1, which shows the amount of all types of film exposed on Operation Ivy.

Table 3.1 — TYPES AND AMOUNTS OF FILM EXPOSED FOR OPERATION IVY

Type of film	Amount
16-mm KCO (commercial Kodachrome)	61,600 ft
35-mm black and white motion picture	18,000 ft
35-mm Eastman color motion picture	1,000 ft
4 by 5 black and white stills	2,244 each
4 by 5 Eastman color ground stills	130 each
35-mm still rolls	36 rolls
K-20 and K-24 5½ by 5½ black and white aerial exposures	1,500 each
K-20 and K-24 5½ by 5½ color aerial exposures	400 each
K-17 9½ by 9½ Eastman color aerial exposures	360 each
K-17 9½ by 9½ black and white aerial exposures	500 each

Project 3.7 requirements were fully satisfied through aerial photographs exposed on this project. The results of this project will be made a part of a separate report.

CHAPTER 4

CONCLUSIONS

4.1 ACTIVATION OF THE UNIT

4.1.1 Personnel

1. The method of supplying Task Group personnel for duty with TU 9 was unsatisfactory inasmuch as only 8 of the 18 individuals requested were actually made available.

2. Flight-status orders for the aerial photography crew members were unsatisfactory, since status as noncrew members only was granted. This was obviously in error inasmuch as the entire mission of each aircraft was dependent upon the functions of the photographic crew members. Flight-status orders were issued from different headquarters, resulting in Army personnel obtaining orders at a different time than Air Force personnel.

3. Flight-crew members of the photographic aircraft should be assigned to the administrative control of the Photographic Unit.

4.1.2 Equipment

1. Priorities established for Operation Ivy simplified expeditious procurement of equipment.

2. Radio units supplied for mobile and fixed communication facilities were of great help, and no equipment malfunction was encountered.

3. Camera booms designed and fabricated under the supervision of Lookout Mountain Laboratory were exceptionally useful for mobile operations and special photographic effects. Some modification of these units will be necessary to obtain more efficient utilization.

4. More research into triggering mechanisms for remotely operated cameras must be done in order to ensure a lower rate of malfunction.

5. Items of aircraft equipment, such as power racks, power supplies, mounts, oxygen equipment, and communications outlets for installation in photographic aircraft, should be fabricated and installed at Zone of Interior depot facilities under the supervision of the personnel who will be using the equipment. Whereas installation effected at Hickam Air Force Base was entirely satisfactory, much confusion and lost time could be avoided by doing this work prior to the overseas phase of the operation.

4.1.3 Organization

This operation was the first in the history of tests in the Forward Area in which the Documentary Photo Unit was assigned directly under the Scientific Task Group. This arrangement was proposed several times on the past tests but because of various circumstances was never actually carried through.

It is the conclusion of all concerned that the documentary photographic mission for Operation Ivy was accomplished with a minimum of the operational handicaps which have slowed

production so badly on previous tests. It was conclusively shown that this production efficiency was directly attributable to the organizational arrangement just mentioned in which the Documentary Photo Group was established as a Task Unit of the Scientific Task Group. Specifically, the following advantages which resulted from this organizational system should be mentioned:

1. Unnecessary channels of communication were eliminated since the Photo Unit was already a part of the Task Group with whose activities it was mainly concerned.
2. Information as to schedules of events and any last-minute changes was readily available inasmuch as the Photo Unit was present along with other Task Units at regular staff meetings.
3. Important personal contacts were easily and quickly made.
4. Technical advice as to important script changes was readily available.

4.2 OPERATIONS

4.2.1 Procedures

Operational procedures for control of the ground photography were satisfactory.

4.2.2 Crew Training

The system of crew training on practice missions was unsatisfactory. Since air-crew members were also ground-crew members, this necessitated bringing all crew members in from outlying locations the night prior to the mission. Furthermore, due to the Kwajalein-Eniwetok separation of crews and aircraft, much confusion was encountered in pickup, delivery to base, etc.

4.2.3 Control of Aircraft

Control of the C-54 aricraft was confusing during parts of the operation. Although TU 9 had theoretical controls, there were instances when one or more of these aircraft were used for other missions of purely transport nature, thus putting time on the engines and jeopardizing their use during photographic air operations. Through the cooperation of TG 132.4 this situation was minimized; however, continued requests for such utilization of photographic aircraft by other units was encountered.

4.2.4 Roll-up

Roll-up was expedited by use of the photographic C-54 aircraft for the transport of personnel and equipment to the Zone of Interior.

The use of one transportainer was of great help in transporting water-lift equipment to the Zone of Interior. These units were very useful in that they ensured sturdy, breakproof, and weatherproof packaging of delicate photographic equipment.

CHAPTER 5

RECOMMENDATIONS

5.1 ACTIVATION OF THE UNIT

5.1.1 Personnel

1. To ensure the obtaining of qualified personnel in time to be utilized on operations in the Forward Area, the following four qualifications are considered mandatory, and each individual should be carefully screened to be sure that he meets them.

(1) Personnel must be "Q" cleared, or clearance procedures must be started sufficiently prior to the operation to ensure time for clearing a replacement should the first individual fail to qualify for clearance.

(2) Personnel must be physically fit for overseas duty, and they should be given physical examinations to determine this prior to departure from their permanent stations.

(3) Personnel must be fully qualified for the performance of the duties for which their services were requested.

(4) There must be sufficient time remaining in the current enlistment or service statement of each individual to ensure his utilization throughout the entire period of the operation for which his services were requested.

2. Requests for flight-status orders for the aerial-photographic-crew members should be expedited and acted upon in sufficient time to ensure orders being prepared to give status as crew members. In past instances orders have never been received prior to actual flights by crew members in operational phases of the air mission. If additional justification for status as crew members is then required, it is too late to supply such justification and have it acted upon by all necessary administrative channels prior to completion of the operation. Requests for such orders should originate so that all personnel for whom orders are requested are issued orders at the same time. These requests should be handled as a Task Force matter and not as a request of an individual service, such as the Army or the Air Force.

3. Flight-crew members of the photographic aircraft should be assigned to the administrative control of the Photographic Unit.

5.1.2 Equipment

1. The priority system for the procurement of material should continue to be authorized down to the lowest units of the Task Force.

2. Radio units, such as the Motorola type used by TU 9 for mobile communications, should be authorized for continued usage by such organizations as TU 9.

3. Modify the present camera booms used by TU 9 in order to make them more adaptable, and continue their use.

4. Conduct studies and research on photocell or other triggering devices for remotely operated camera installations to ensure better reliability, and continue their use. Also, conduct

studies and research into methods of heating or otherwise protecting cameras such as the one installed in the bomb bay of the B-36 drop aircraft in order to ensure against malfunctions from such factors as low temperature and faulty electrical circuits.

5. Install all necessary specialized equipment for photographic aircraft at Zone of Interior depots or other locations, and make installation directly under the supervision of the organization using the equipment.

5.1.3 Organization

In Operation Ivy as well as in future tests, the documentary photographic emphasis must necessarily be upon the scientific program. With certain exceptions the military participation in the tests presents only the routine logistic support to be documented, and, since this does not change, it does not present anything new to add to a documentary motion picture. It is in the Scientific Program that the heart of the documentary story lies. Therefore it appears evident, and it is strongly recommended, that in all future tests the Documentary Photo unit should be assigned as a part of the Scientific Group as it was on Operation Ivy.

5.2 OPERATIONS

5.2.1 Procedures

Continue work orders and the script system for accomplishing documentary photography.

5.2.2 Crew Training

Arrange to assume control of all photographic aircraft before departing for overseas operations and in sufficient time prior to the move to ensure a training period in the Zone of the Interior during which photographic and flight crews can become oriented and trained in the specialized aspects of the aerial photography of nuclear explosions. In this way all training can be accomplished while photographic crews have no other duties with which to be concerned. Furthermore, all personnel will be centrally located and immediately available for training missions as required.

It is further recommended that the number of practice photographic missions flown be at the discretion of the Task Unit Commander until he is assured that all crew members are trained and competent in their assigned duties.

5.2.3 Control of Aircraft

It is recommended that all photographic aircraft and flight crews be assigned to the Air Photographic Unit for the sole purpose of conducting aerial photography as directed by the commander of that unit. A clear and written understanding of such operational control should be established early in the planning phase of the operation. Emphasis must also be placed on the amount of ground time necessary to install and maintain camera equipment in each aircraft.

5.2.4 Roll-up

It is recommended that all aircraft assigned for photography be made available to the photographic unit for required airlift of personnel and equipment, both to the overseas site and from there back to the home base of the photographic unit. Operational controls should extend from the organizational phase through the final roll-up.

It is further recommended that arrangements be made to obtain the necessary number of transportainer units to provide secure water-lift packing for the delicate photographic equipment required to be water-lifted to overseas bases.

SUPPLEMENTARY

INFORMATION

Defense Nuclear Agency
6801 elegraph Road
Alexandria, 'irginia 22310-3398

IMST

5 January 1996

ERRATA AD363629

MEMORANDUM FOR DEFENSE TECHNICAL INFORMATION CENTER
ATTENTION: OCD/Mr. Bill Bush

SUBJECT: Declassification of AD-363629 and Removal of AD-A995406

The Defense Nuclear Agency Security Office has **declassified and approved for public release** the following report:

AD-363629
WT-612 dated November 1952.

Since AD-363629 is declassified and approved for public release, AD-A995406 (WT-612-EX) now is obsolete and must be removed from the NTIS system.

for Judith Jarrett
JOSEPHINE B. WOOD
Chief, Technical Support

Defense Special Weapons Agency
6801 Telegraph Road
Alexandria, Virginia 22310-3398

JUN 11 1997

OPSSI

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Declassification Review of Operation IVY Test Reports

The following 31 (WT) reports concerning the atmospheric nuclear tests conducted during Operation IVY in 1952 have been declassified and cleared for open publication/public release:

WT-602 through WT-607, WT-609 thru WT-618, WT-627 thru WT-631, WT-633, WT-635, WT-636, WT-639, WT-641 thru WT-644, WT-646, and WT-649.

An additional 2 WTs from IVY have been re-issued with deletions. They are:

WT-608, WT-647.

These reissued documents are identified with an "Ex" after the WT number. They are unclassified and approved for open publication.

This memorandum supersedes the Defense Nuclear Agency, ISTS memorandum same subject dated August 17, 1995 and may be cited as the authority to declassify copies of any of the reports listed in the first paragraph above.

RITA M. METRO
Chief, Information Security